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BULLETIN OF MISCELLANEOUS INFORMATION No. 1, 1937 ROYAL BOTANIC GARDENS, KEW

I — ECOLOGICAL METHODS IN THE STUDY OF NATIVE AGRICULTURE IN NORTHERN RHODESIA. C. G. TRAPNELL.

INTRODUCTION

The ensuing short account is a review of principles which have emerged in the course of an attempt to apply ecological methods to the study of native agriculture in Northern Rhodesia. The Ecological Survey of Northern Rhodesia was inaugurated in June of 1931 by Professor R. S. Adamson of Capetown University, and staffed by an Ecologist and an Agricultural Officer. It had as its objects the determination and mapping of types of country in terms of their vegetation cover, the study of existing agriculture and the natural products found within these types of country, and in particular the provision of a basis for native agricultural development. There was no precedent for a large scale survey of this type, and the principles of its working had to be found rather than applied.

Three types of survey might have been employed for the purpose of agricultural study in this territory. A large scale soil survey would have provided information on the environmental factors of primary importance in determining variations in agricultural practice and potentialities. It would, however, have been slow and expensive in operation by reason of the need for a very large number of analytical determinations of variations in soil fertility: or alternatively, had it been conducted on the basis of profile observation and field classification without these analyses, would have failed to provide all the requisite information. A method of regional survey, or the geographic surveys made in the United States, would have brought into consideration all external factors, but would have been considerably handicapped by the lack of soil survey or of available geological survey, and also by the absence of pronounced topographic variation over much of the territory. Vegetation survey theoretically provided a means of integration of these factors and if conducted with due allowance for climatic variation and for changes induced by biotic factors, was held to provide the quickest efficient means of land classification. This method was employed, with full regard to the fact that it was necessary to ascertain at the same time the amount and type of soil study necessary.

A survey of this type involves either the hypothesis of a direct correlation of vegetation type with agricultural practice and potentialities, or that of a correlation of vegetation with soil type or

fertility as analytically determined, and thereby with agricultural potentialities. In an initial detailed survey of 13,000 square miles of the lower Kafue basin, both hypotheses were tested. The first received immediate support from the native, for it was found that he recognised, and employed in the selection of his cultivation sites, the same types of bush or other plant indicators as those which the survey would employ, and had a definite, if ill-formulated, conception of differences in fertility which they indicated. These differences were made evident, in addition, by the different crops employed in each type by native and European, and their varying growths and yields. This aspect is discussed later. The correlation between vegetation type and soil fertility was also to have been tested analytically, but the work was terminated by the retrenchment of the soil chemist of the agricultural department at a point when promising results were being obtained. Independent field observations on soil derivation and profile were, however, kept, which have now resulted in a soil classification, primarily upon a physiographic basis, which answers closely in its main types to that approved for the East African Soil Map at the recent conference of Soil Chemists at Zanzibar.

It is necessary first to consider the degree of correlation obtained between soil and vegetation type, the reasons for lack of correlation where found, and the type of mapping unit which emerges as desirable for agricultural purposes. The rest of this paper is concerned with agricultural aspects.

MAIN SOIL GROUPS.

For the purpose of considering their relationship to the vegetation, the soils of north-western Rhodesia may be divided into six main groups whose distribution is shown approximately on the accompanying sketch map (no. 1):

(1) *Kalahari group* of deep loose desert sands of late tertiary age covering the western or Barotseland half of the old peneplane at an altitude of 3,000 to 4,000 feet and more.

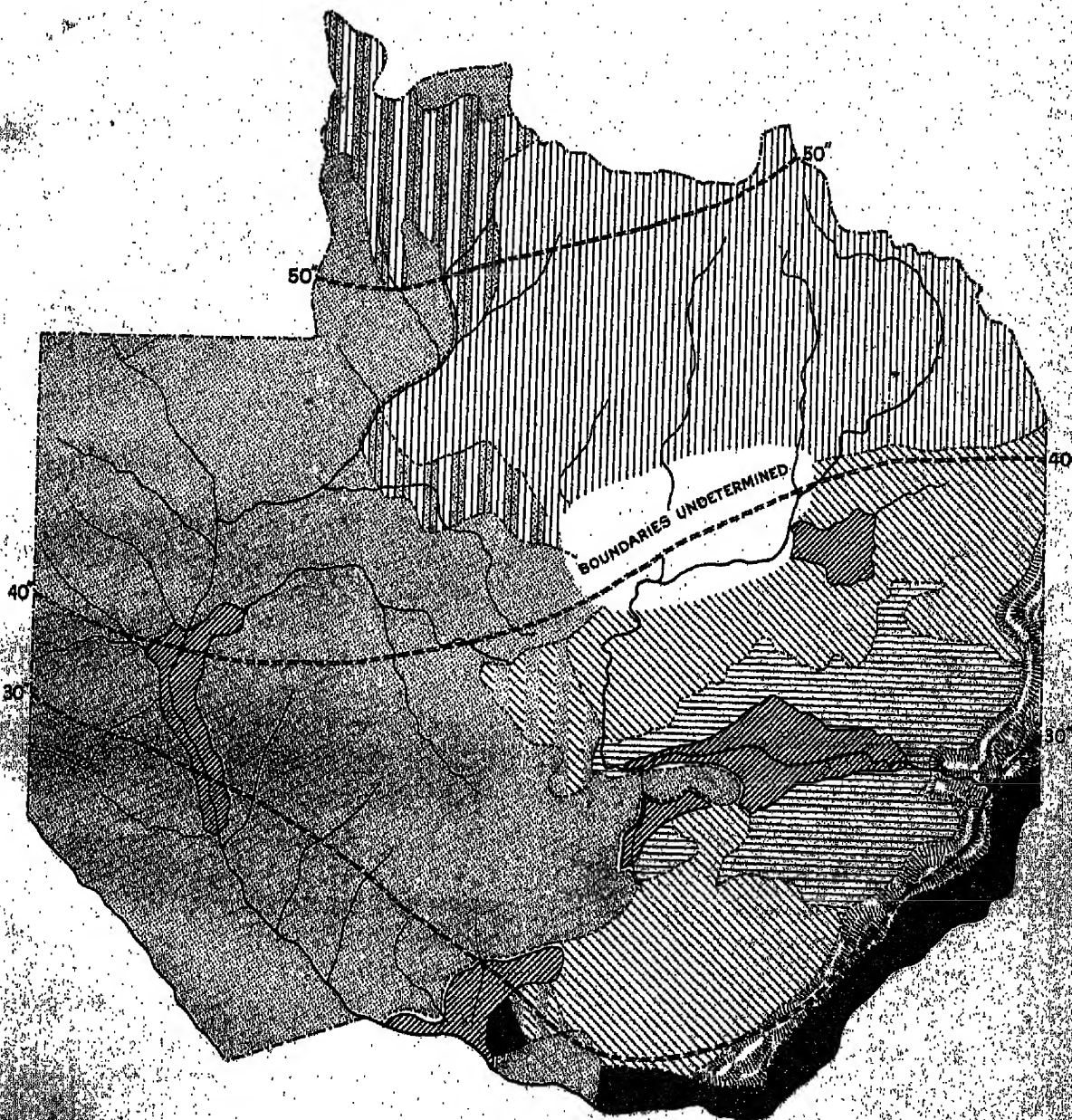
(2) *Northern Plateau group* of clayey eluvial soils, typically with a horizon of ironstone nodules, occupying the northern half of the modified peneplane on pre-Karoo rocks at an altitude of 3,500 feet to 4,500 feet under a rainfall of 40-50 inches.

(3) *Southern Plateau group* of sandy eluvial soils, again typically with a horizon of ironstone nodules and of derivation similar to the last, but physically distinct. They lie mainly on archæan rocks at an altitude of 3,000 to 4,000 feet under a rainfall of 30 to 40 inches.

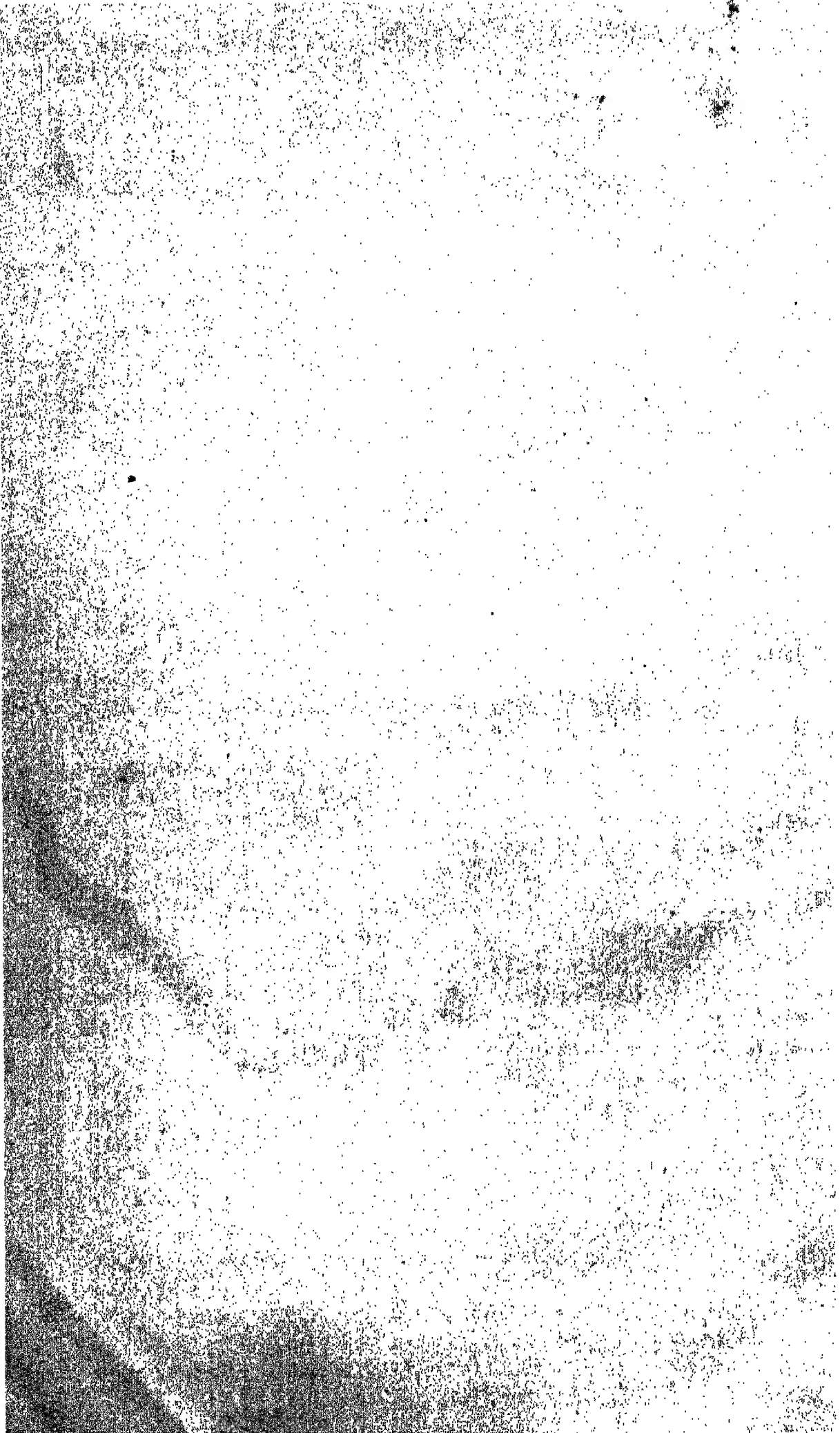
(4) *Upper Valley group* of sandy soils of a relatively immature residual or colluvial type, occupying the margins of the dissected peneplane particularly on calcareous formations about the lower Kafue basin. They are found under a rainfall similar to the last but tend to a rather lower altitude.

(5) *Lower Valley group* of gravels, sands and clayey sand soils, with a tendency to a horizon of lime concretions. They occupy the

MAI RAINFALL ZONES AND SOIL REGIONS



- KALAHARI SANDS.....
- NORTHERN PLATEAU SOILS.....
- SOUTHERN PLATEAU SOILS.....
- UPPER VALLEY SOILS.....
- LOWER VALLEY SOILS.....
- ALLUVIAL PLAIN SOILS.....
- ESCARPMENT HILL SOILS.....



trough of the lower Zambesi valley on Karroo beds mainly between 1,000 and 2,000 feet, but Karroo basaltic gravels ascend to 3,000 feet by the Victoria Falls. Rainfall may be placed at 20 to 30 inches.

(6) *Alluvial Plain group* of grey and black clays with a pronounced horizon of calcareous concretions, occupying the past and present day flood plains. Sandier and more peaty soils free of concretions are found in the Barotse Plain.

As explained, these soils have only received analytical study in the case of the Southern Plateau and Upper Valley soils about the lower Kafue basin. Such analyses as were completed indicated that the Upper Valley soils collectively were less leached and possessed a higher phosphate and nitrogen content than the Plateau soils, while more liable to compaction and erosion. They are divided into poorer mainly residual "Transitional" soils and more fertile colluvial "Thorn" belts which form the best maize lands in north western Rhodesia.

VEGETATION—SOIL RELATIONSHIP.

The relationship of vegetation types to the main soil groups may be outlined broadly as follows :

(1) Dense evergreen *Cryptosepalum* woodland or forest with a distinctive Angolan flora is restricted to the northern and upland Kalahari sands and appears to be endemic to them. It has been invaded from the east by *Brachystegia* and *Isoberlinia* as noted below, but retains its own distinct seral phases.

(2) *Baikiaea* semi-deciduous woodland and forest with *Burkea* seral phases occupies the same position on the southern and low-land sands. Dense *Baikiaea* forest of commercial size, with seral or understory *Acacia* and *Combretaceae* marks a distinctive class of "Transitional" sands with a high pH and fertility of maize standard.

(3) Northern deciduous woodlands of *Brachystegia* spp. with *Isoberlinia*, *Uapaca* and locally *Marquesia*, characterised for soil purposes by association with *Brachystegia floribunda*, answer to the Northern Plateau soils in distribution. A distinctive class of dense high *B. longifolia* woodlands often marks ferruginous red earths on calcareous formations within this group.

(4) *Isoberlinia paniculata* and to a lesser extent *Brachystegia mpalensis* and *B. longifolia* occupy an anomalous position in that they have invaded a vast area of the eastern and upland Kalahari sands. In particular much of the distribution of *I. paniculata* woodland is hard to explain except on the assumption of a mass invasion which is still in progress.

(5) Southern *Brachystegia-Isoberlinia* and *Isoberlinia-Uapaca* woodland occupies the Southern Plateau soils with the exception that *Brachystegias* and the normal *Isoberlinia globifera* are replaced by *I. paniculata* towards the north on poor sandy soils with a marked ironstone horizon. Better soils approaching those of the next type are occupied by *B. mpalensis* or *B. spiciformis*.

(6) Floristically distinct from the Plateau *Caesalpineae* and the Angolan types of the sands is a deciduous scrub-woodland of *Combretaceae* with climax *Papilionaceae* and semi-relict thickets of *Canthium*, *Dalbergia*, etc., which passes into *Acacia* tree-grassland on fertile colluvial soils. This association with its varied seral phases appears to be directly correlated with the occurrence of Upper Valley soils. The fertility differences between its *Acacia* (Thorn soil) and *Combretaceae* (Transitional) variants and the *Brachystegia* woodlands of the Southern Plateau soils have already been noted.

(7) On Lower Valley soils of a class approaching the last (residual and colluvial chestnut sands) the Combretaceous community is replaced by dense deciduous *Commiphora* scrub, while *Acacia* is practically restricted to alluvium. The difference between this and the last type is by no means entirely climatic for the Combretaceous and *Commiphora* types are found at inappropriate altitudes where soils of suitable derivation occur.

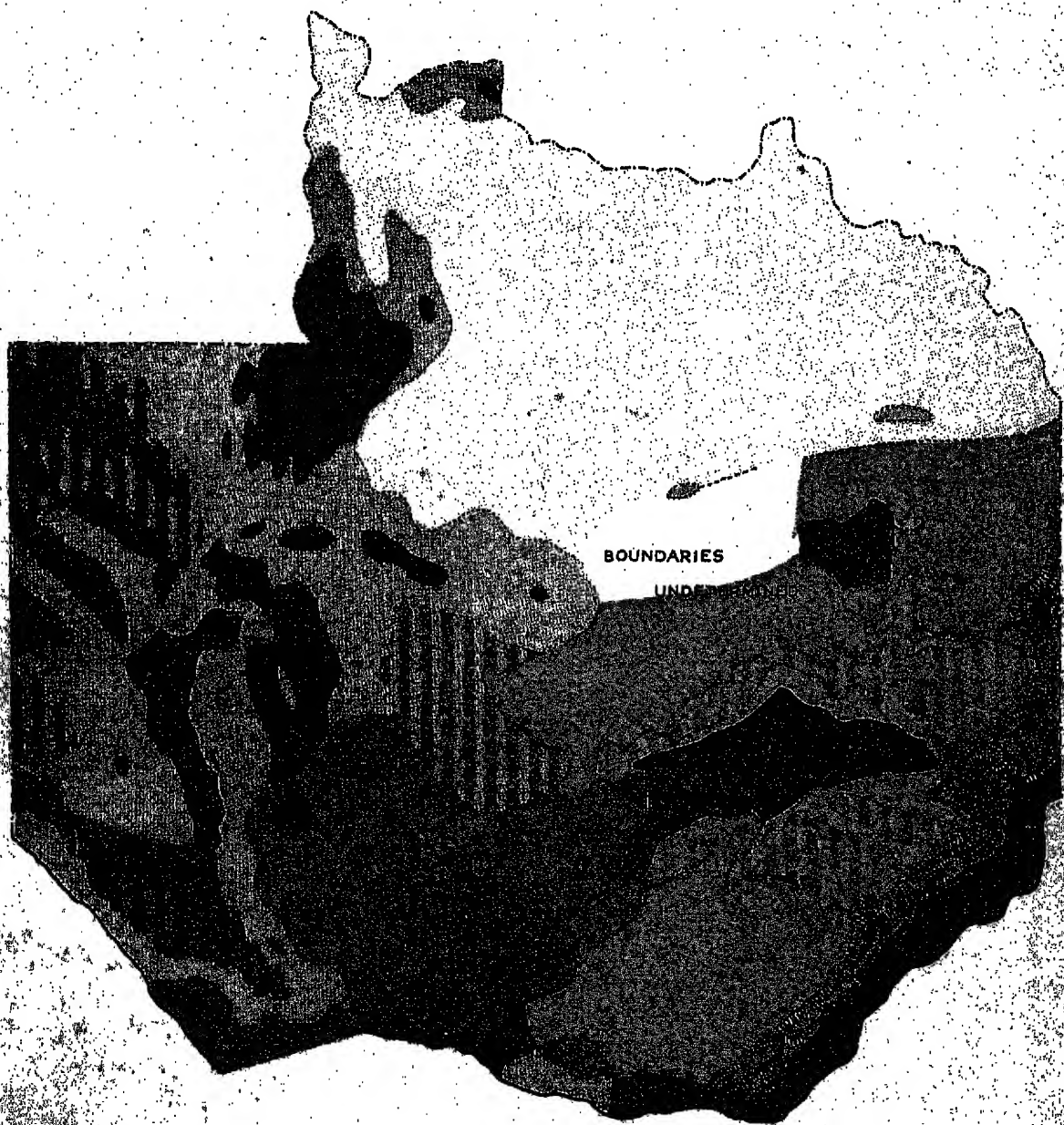
(8) *Copaifera Mopane* occupies Karroo Valley soils of a highly erodible type and appears to be invading the last with the assistance of erosion. Mixed *Copaifera-Commiphora* vegetation is found on the higher gravels, and *Copaifera* is also dominant on old alluvial clays of pedocal type in the Machili and Nanzhila depressions.

(9) Alluvial Plain soils other than those of the Machili and Nanzhila depressions are under grassland. To these should be added the remarkable seasonal swamp-grasslands on the flat water-sheds of west Barotseland.

CHOICE OF MAPPING UNITS.

It will be seen that within certain climatic limits there exists a general correlation between floristically distinct vegetation types and soils of different classes in respect of their derivation and history. The reasons for this are as yet inadequately understood, and discussion of what reasons have been inferred and their bearing on the climatic climax view of vegetation types would occupy more time than is here permissible. The main exceptions to this correlation appear to be due to mass invasions by certain species of *Caesalpineae* which find support in Henkel's observations of invasion of *Baikiaea* sand forests by *Brachystegia-Isoberlinia* in Southern Rhodesia. Apart from these exceptions it becomes possible to employ for mapping purposes vegetation-soil units which are significant for agricultural purposes and, as will be seen, particularly suitable for the study of native agriculture. In practice selection of types has been made with regard to their agricultural significance; and where the agricultural objective has required that greater or less importance be attached to either vegetational or soil aspects, the type has been selected accordingly. Thus, although not all of one kind, the *Cryptosepalum* woodlands and forests require to be separated as one unit irrespective of variations in their sand, because of their direct influence on the distribution of certain types of

MAIN VEGETATION - SOIL UNITS.



KALAHARI TYPES

- CRYPTOSEPALUM* sands.....
- Northern *BRACHYSTEGIA*-
-*ISOBERLINIA* sands.....
- Southern *ISOBERLINIA* sands.....
- BAIKIAEA* - *BURKEA* sands.....
- BAIKIAEA* Transitional sands.....

NORTHERN PLATEAU TYPES

- SOUTHERN PLATEAU TYPES
(Escarpment Hill country).....
- UPPER VALLEY TYPES.....
- LOWER VALLEY TYPES.....
- ALLUVIAL PLAIN TYPES
Alluvial grasslands.....



cassava and bullrush millet (*Pennisetum*) cultivation. By contrast the dense commercial *Baikiaea* forests and certain *Burkea*, *Terminalia* and *Acacia* variations associated with them have been combined as one unit because they collectively occupy the Transitional Sands which are suitable for native maize cultivation.

Where the soil-vegetation relationship has been obscured by the processes of invasion already alluded to, soil and climatic factors have been given primary importance. Thus *Brachystegia-Isoberlinia* woodlands on the Kalahari Sands have been differentiated from those on the Southern or Northern Plateau soils, while upon climatic grounds the Northern *Brachystegia-Isoberlinia* woodlands of the sands, with *B. longifolia* associated, have been differentiated from the Southern *Isoberlinia* sand woodlands without this species. The classification of these monotonous woodlands is bound to be somewhat arbitrary. In general it is necessary for practical purposes to employ units which are single, composite or partial vegetation types, defined with regard to their soil relationship, or combined or subdivided as ascertainable soil differences and the agricultural objects require. A simplified map of types here relevant is given (no. 2).

A method of survey in which vegetation is given primary importance in the differentiation of type of country makes for the greatest ease and rapidity of mapping. It allows of the use of native information, for the native can define the forests where he cannot define the soil; he can also supply much information in advance of a traverse which will greatly facilitate sampling. But most important for present purposes is the fact that a modified vegetational method provides a land classification which is immediately applicable to native agricultural practice.

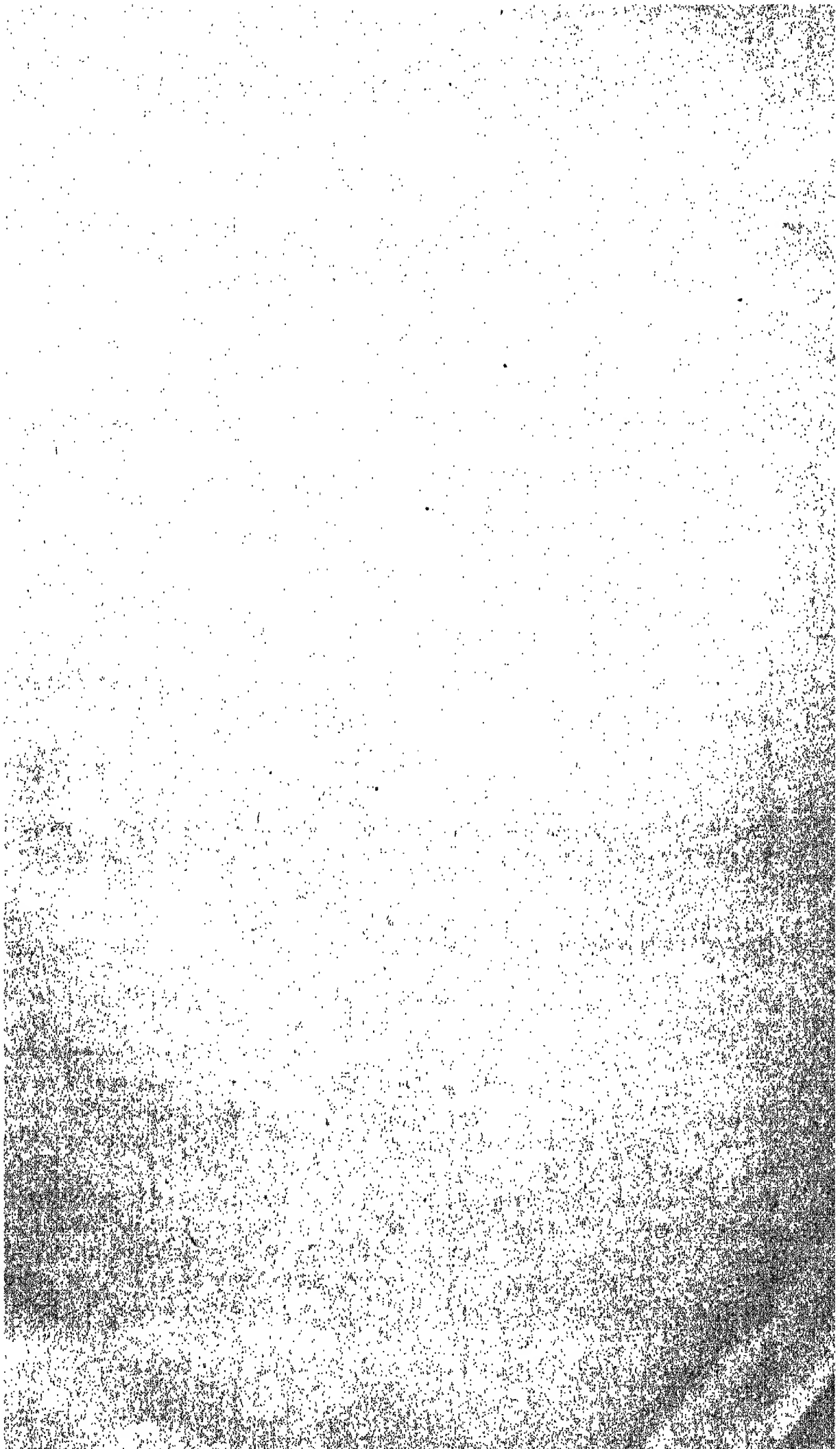
NATIVE LAND SELECTION.

The reason for this lies in the native's method of land selection. Certain trees and grasses, or a certain type of bush, are recognised, normally intuitively and without conscious thought, as indicating good land for the staple crop or for the various types of garden made. Selection for soil fertility is general, but there are exceptions to this among certain forest tribes who rely for fertility on the ash of the trees which they fell to make their gardens and who may haul in brushwood from an area much larger than that cultivated in order to obtain the requisite supply. This primitive stage persists among the Kaonde and allied tribes of the Northern Plateau region. Their tradition, and possibly a general deficiency in the soil, requires heavy fertilising with wood ash, and they have remained content with the selection of stands of timber convenient for cutting, commonly using poor forest on poorer soil than they could obtain. A stage once removed from that of the Kaonde is found in certain tribes of the Lunda-Luvale group on the Kalahari sands of north Barotseland. Climax forest of certain trees, notably *Cryptosepalum*

pseudotaxus, is selected, primarily because the tree gives a dense brushwood for ash for bullrush millet cultivation, but also because climax forest soil is recognised as good. The advanced Luchaze, referred to later, indicate this by saying that they choose *Cryptosepalum* forest with the moss *Leucobryon dimorphodictyon* which covers the forest floor in the climax phase.

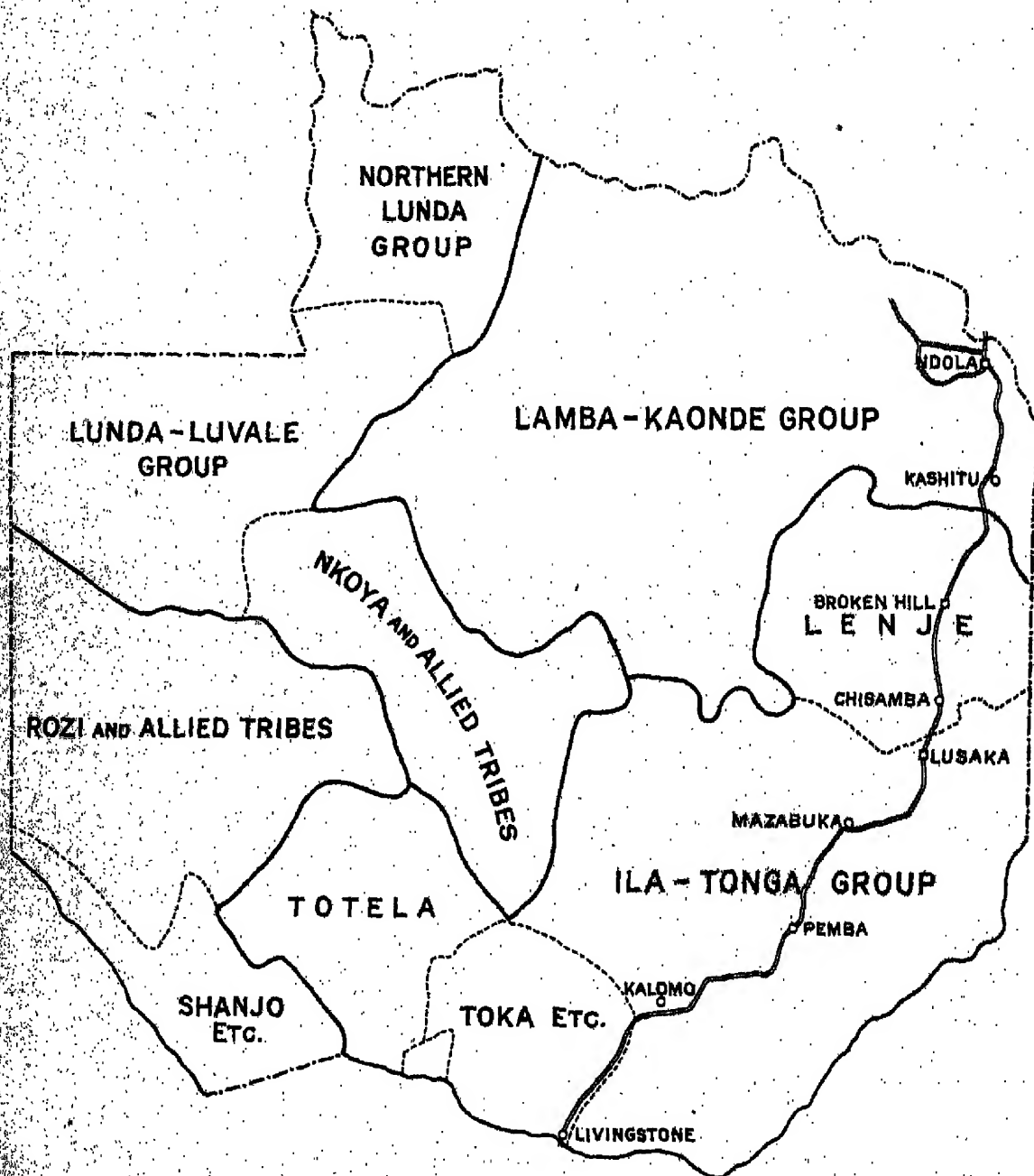
A more definite use of trees and grasses as indicators of soil fertility is found among tribes outside these two groups. The fertilising effect of the ash is treated as incidental to the making of the bush garden, or, as among the Lenje and Tonga on the Southern Plateau soils, deliberate ash fertilising is retained for certain crops which require it. Apart from this, the main and subsidiary gardens are selected for soil fertility. The most important indicators are various species of *Acacia*, notably *A. campylacantha* among the Ila and Tonga of the upper valley region, and of the grass *Hyparrhenia*, such as *H. Ruprechtii*. While the sites are recognised intuitively, the indicator will be readily named in response to questioning and the same answer will be given in village after village. Regard is also had to soil colour, but not to this alone. Among the Ila-Tonga group indicators of both good and bad soil begin to be recognised and the crop for which the soil under a particular type of bush is suitable, the period for which it can be worked and even the phase in the succession at which it can be returned to are known. Finally the most advanced stage is represented by the methods of the Luyi or Rozi group of tribes in and about the central Barotse Plain in the Kalahari region. These people have a highly developed system of small gardens in grassland, and the various sites and combinations of these gardens are determined by a series of indicator grasses which have come to be used not only consciously but also traditionally for recognition of the sites.

A full discussion of this "Luyi code" of land selection would require a separate paper, but it may be used as an extreme example of the fact that native principles of land selection cannot be understood without ecological study of the country. The sites are placed in grassland which varies in composition according as the soils range between acid sand, seepage peat, basic clay loam and swamp peat. Through these grasslands are distributed raised wet season gardens and sunk dry season gardens for maize and kaffir corn, drained seepage gardens for winter maize, tara and other characteristic crops, subsoiled sweet potato and cassava gardens, etc. There is an appearance of complete confusion of method until the various garden types are worked out in relation to the zonation of the grasslands and the soil and moisture variations which they indicate. Without further instances it can be said that in north western Rhodesia the native's land selection and therefore the types of garden which he makes, cannot be fully understood until his sites are studied and discussed with him from an ecological standpoint.



MAIN TRIBAL GROUPS

(AFTER OFFICIAL TRIBAL MAP OF NORTHERN RHODESIA)



NATIVE AGRICULTURAL SYSTEMS.

With this precision of land selection is associated an admirable adaptation of agricultural systems to their environment, as constituted by the type of soil and forest occupied. This applies particularly to the distribution of staple crops and to the broad lines of agricultural practice. Agricultural practice is, of course, largely determined by tradition, but tradition itself reflects past environment, and when a tribe has been long settled in its country its tradition complies with its requirements. It has thus been found that, except in cases of recent immigration, the extent of a given agricultural system can be defined by a vegetation-soil unit.

It is again impossible to go into the detail of this relationship for the 30 or 40 tribes concerned in north western Rhodesia. But the main systems, excluding some of tribes of intermediate position along the Kalahari contact, are summarised here for comparison with the soil and vegetation types previously described. These systems or groups of systems may be classified broadly as :

(1) *The Northern Kalahari Forest System* of the southern section of the Lunda and the Luvale group of tribes with cassava and bullrush millet the normal chief crops, answering to the northern zone of mixed *Cryptosepalum* and *Brachystegia-Isoberlinia* sands.

(2) *The Southern Kalahari Woodland System* of the Totela with bullrush millet the main crop and other cereals subsidiary, answering to the southern *Isoberlinia* sands.

(3) *The Southern Kalahari Thicket System* of the Shango and other southern Sikololo-speaking tribes with maize normally the chief crop and bullrush millet subsidiary, answering to the southern zone of *Baikiaea* Transitional sands.

(4) *The Central Kalahari Plains System* of the Luyi or Rozi group of Sikololo speaking tribes with maize and locally kaffir corn staple crops but cassava bush-cultivation also adopted, answering to the Barotse Plain and a surrounding region with plains sites in the central loose sands.

(5) *The Northern Kalahari Contact System* of the northern Lunda group and adjoining Luba, with cassava and finger millet chief crops, occupying contact soils under mixed *Brachystegia* adjoining the northern Kalahari region.

(6) *The Northern Plateau Forest System* of the Lamba-Kaonde group of tribes with kaffir corn cultivation on an ash-fertilising tradition probably derived from ancestral finger millet cultivation, answering to the Northern Plateau soil zone of *Brachystegia floribunda*.

(7) *The Southern Plateau Woodland System* of the Lenje, Plateau Tonga and others, with kaffir corn the original staple and varying subsidiary crops, answering to *Brachystegia-Isoberlinia* woodlands on the Southern Plateau soils.

(8) *The Upper Valley Thorn System* of the Masukulumbwe section of the Ila-Tonga group with maize and kaffir corn chief

crops, similar to the last but distinct in practice through the selection of *Acacia* belts for long-period maize cultivation.

(9) *The Lower Valley Thorn System* of the valley Tonga with kaffir corn and bullrush millet chief crops, following the *Acacia* belts of riverside alluvium in the lower valley *Copaifera-Commiphora* bush.

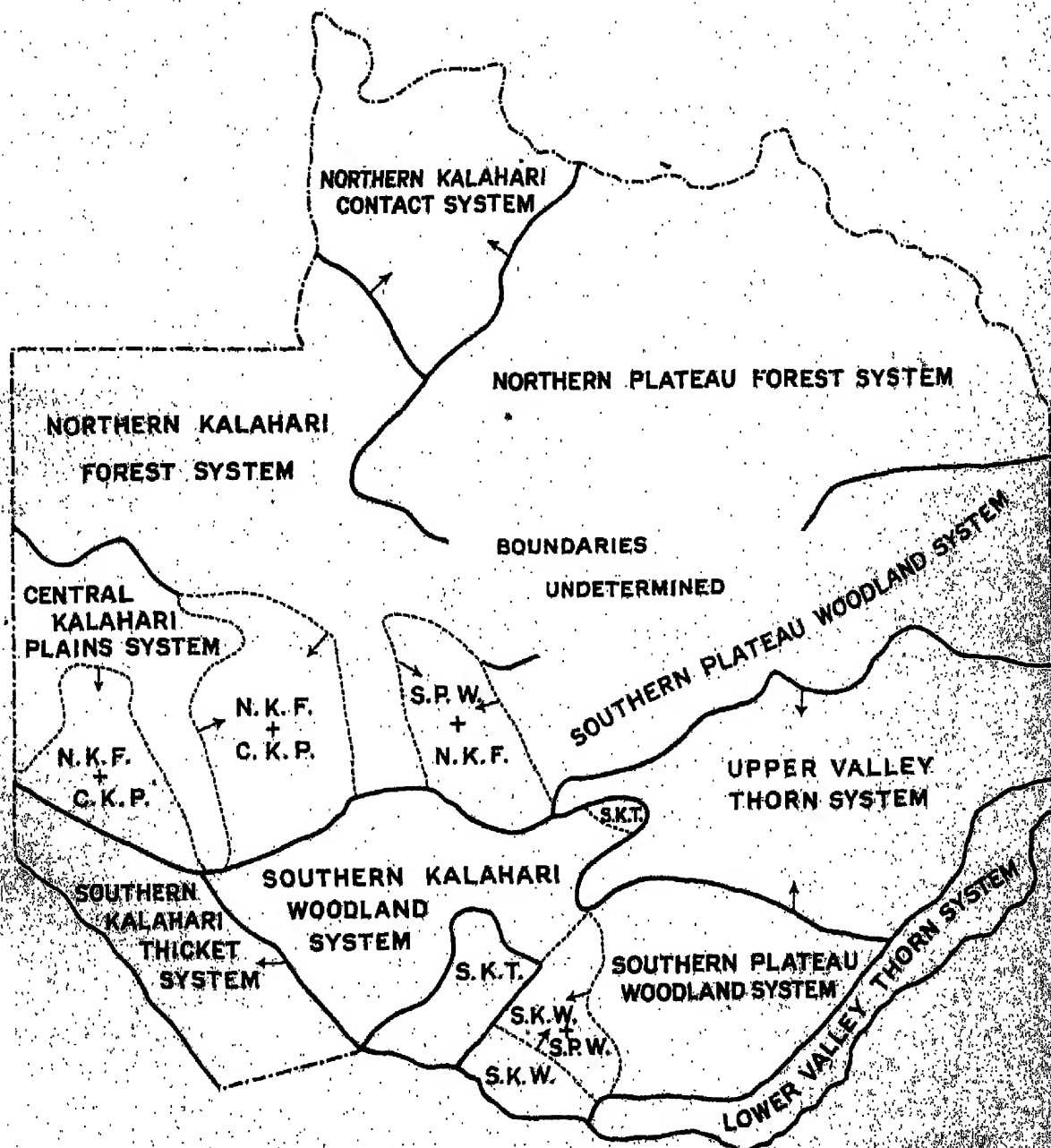
The relationship of the agricultural system to the vegetation-soil unit may be further illustrated by the fact that in the case of tribes who have migrated in comparatively recent time either the method is changing under the influence of a fresh environment and the contact of tribes proper to that region, or in some cases, the actual migration is being controlled by the soil requirements of the staple crops and by a whole set of associations, real and imaginary, which the forest type holds for the tribe that has lived in it. To illustrate these points in order, the southern Kaonde have pushed down to the southern limit of *Isoberlinia paniculata* on hard soils suitable for kaffir corn and now associate themselves with this tree, saying that they will not go into the country where *Cryptosepalum* enters and deep sands are unsuitable for kaffir corn cultivation. On the other hand the Nkoya, whom they are believed to have driven into the sands, are, it would seem, changing from a kaffir corn to a cassava system. A similar change has certainly taken place among the Lunda as they have worked down south into the *Cryptosepalum* zone. By contrast with these cases, the voluntary immigration now in progress of the advanced Luchaze tribe from Angola is following the densest *Cryptosepalum* forest of the type to which they were accustomed on the upper Lungwebungu, without change of agricultural method.

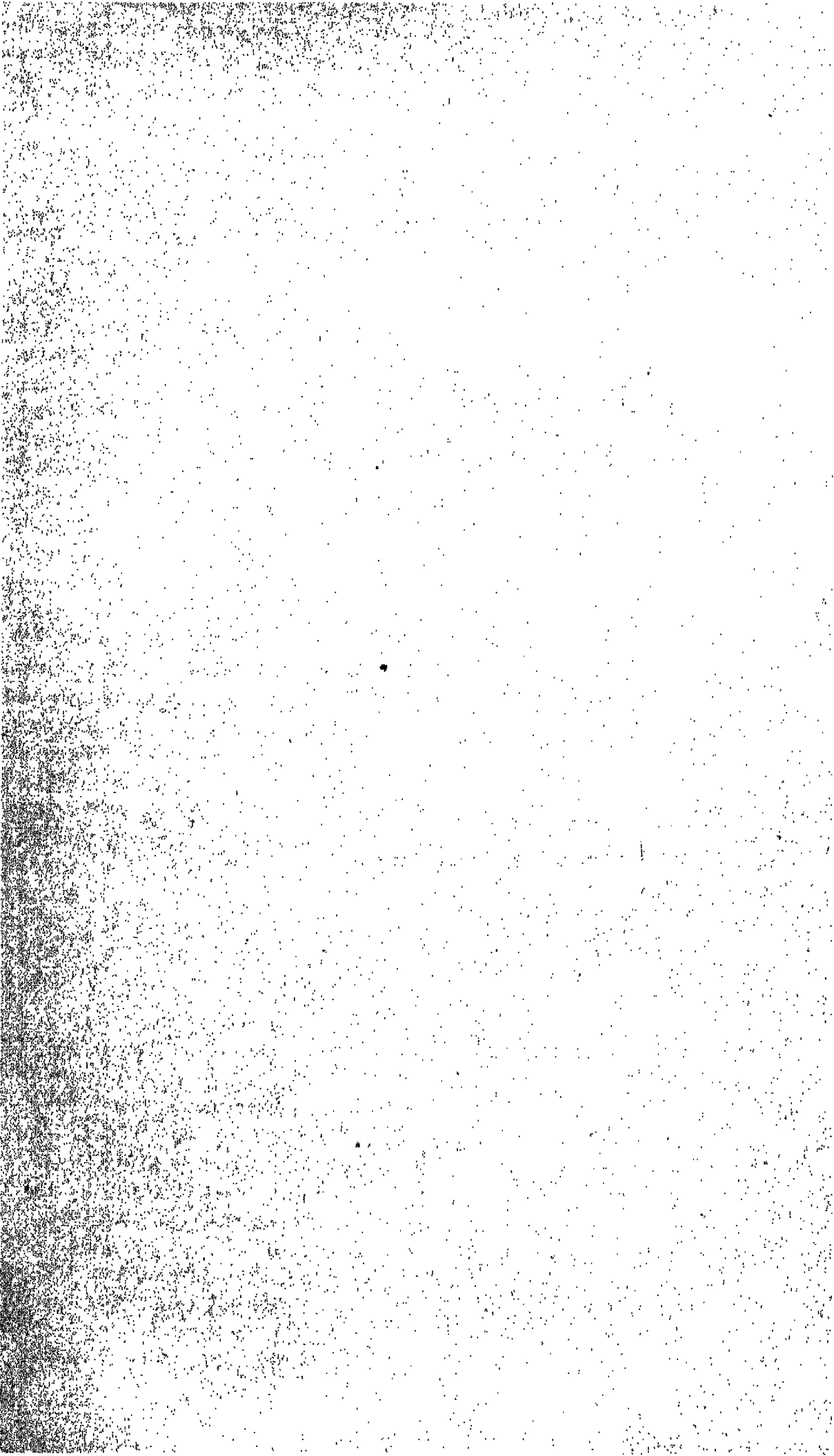
PROGRESS IN NATIVE AGRICULTURE.

The parallel study of vegetation-soil units and of native agricultural systems allows of a comparative treatment of these systems from which their degree of development may be estimated, and means found for their improvement upon native lines. This requires some explanation. Progress in native agriculture, where it takes place naturally, is an important point unlike the progress of European communities. Normally it attempts no defeat of environment by the increasing use of fertiliser and other extraneous aids. Adhering to its primitive implements it follows the less ambitious but effective course of an increasingly thorough use of environment. Differences in development of this type are to be found between and within the systems previously quoted. These differences are best summarised as given in the report of the Survey for 1934 "Certain tribes or sections of tribes fall short of the rest in the degree of development of their system. They may lack either the precision of land selection, the variety of gardens and crops or the efficiency of cultural methods of their more advanced neighbours. Commonly their apparently backward methods are the outcome of limitations imposed on them

NATIVE AGRICULTURAL SYSTEMS.

OVERLAPPING SYSTEMS SHEWN BY ARROWS.





by their environment, and cannot for that reason be improved. But they may equally be conditioned by an inferior mentality and lack of initiative, a low standard of living, lack of contact with other tribes or conservative adherence to an outworn tradition."

Improvement is taking place naturally where, as in Barotseland, an advanced tribe has suzerainty and, at the same time, a great intermingling of tribes has taken place. Marose chiefs have encouraged the spread of the Luyi system, and there has been an exchange of methods and crops and a levelling up of the standard of living. In other cases measures for the accomplishment of this have been suggested by the Survey in the report for 1934 referred to previously.

The possibilities of progress of this type, namely upon native lines, are best investigated upon the basis of comparative ecological survey, because it allows of the adoption for trial of the practices of neighbouring peoples and thus involves the minimum of agricultural experiment. A similar if less obvious application of ecological methods is possible in cases where native agriculture has been adversely affected by contact with Europeans. These changes tend to be retrogressive rather than progressive. The native's knowledge of his environment is forgotten, his traditional system forsaken for a parody of European methods and large scale shifting cultivation of crops for the market leads to land shortage, deforestation and erosion. This state of affairs in reserves adjoining the railway line is alluded to in the report of the Survey for 1933. The processes of change are best worked out by an ecological-agricultural survey, for departure from traditional methods of land selection as well as of agricultural practice are involved. There is, for example, a general tendency to move from Southern Plateau and Transitional sites into thorn belts, particularly of the *Acacia Woodii* type which provides the best European farming land, the object being to secure large areas of easily stumped fertile land. Both these stages and the corresponding stages in departure from the traditional agricultural system have to be recognised before the process can be understood, and remedial measures may have to combine European practices for maintaining fertility with a modified form of the native's tradition.

So long as traditional native practice is involved, an ecological basis is necessary for agricultural development in native areas, for the traditional practice can only be understood through its relationship to environment. This aspect has been deliberately stressed in place of the obvious application of ecological study to question of crop introduction, forest conservation or the prevention of erosion. The general principle underlying this aspect may be stated in conclusion. In Northern Rhodesia, if not in other East African territories, the soil is the factor of primary importance in determining vegetation types, these in turn guide the native's land selection and upon his land selection is based the form of his agricultural tradition. For the understanding of that tradition

the accomplishment of progress in it or the remedying of departure from it it is necessary to look at the soil, and to look at it in the manner of the native, namely through the indications given by the vegetation.

II—NATIVE MEDICINAL AND POISONOUS PLANTS OF EAST AFRICA. P. R. O. BALLY (Basel, Switzerland).

We are privileged to publish in the following paper the results of Mr. Bally's recent researches into the native uses of East African plants. The majority of the specimens and the information relating to them were collected personally by the author in Tanganyika Territory, but he has also included a certain number (i.e., some remedies used by the Waha, the Wa-Ikizu, and by the Wa-Jaluo) which were kindly supplied to him by the East African Agricultural Research Station, Amani, and the Laboratory Services at Dar-es-Salaam. Some of the determinations were checked at the Kew Herbarium.

In view of the large number of species concerned, the information given in the present paper is confined to botanical and tribal names, uses, and parts employed, omitting all information regarding mode of use, dosage, published literature, and pharmacology.

With regard to tribal names, Mr. Bally wishes to point out that he found these often misleading, the witch doctors of most tribes having their own nomenclature for medicinal plants in order to protect their professional secrets.

The classification followed is that of Hutchinson, "Families of Flowering Plants."

The arrangement of the matter is as follows:—(1) Latin name; (ii) tribal name or names, with names of tribes in brackets; (iii) medicinal uses, with part of plant employed in brackets.

FILICES

CYATHEACEAE

Cyathea usambarensis Hiern. Loonge (Chagga). Tapeworm (core and young leaves).

POLYPODIACEAE

Pteris dentata Forsk. Kichameri (Chagga). Ankylostomiasis (core and root).

DICOTYLEDONES

ANNONACEAE

Annona chrysophylla Bojer. Mtopetope, Mfira, Mkonora (Nyamwesi). Antidote for snakebite (leaves); criminal use for poisoning (root).

Popowia fornicata Baill. Mkalia (Nyamwesi). Antidote for snakebite (powdered leaves).

Popowia sp. Msogu (Nyamwesi). Ankylostomiasis (root).

Uvaria leptoclados Oliv. Mshofu (Shambaa); Esa (Suaheli); Mguene, Msarasi (Nyamwesi). Epileptic fits, sunstroke, tonsillitis (root).

Xylopia Antunesii Engl. et Diels. Mshenene (Nyamwesi). Cure for barrenness (root).

MONIMIACEAE

Xymalos monospora Baill. Mkaliakusimu (Nyamwesi). Antidote for snakebite (bark of root).

LAURACEAE

Cassytha filiformis L. Mlangamia (Nyamwesi). Antidote for snakebite (whole plant).

Ocotea usambarensis Engl. Mkulo, Nkuro (Shambaa). Abdominal pains (bark).

RANUNCULACEAE

Clematis inciso-dentata A. Rich. Magasa (Chagga). Headache (leaves and root).

Ranunculus pinnatus Poir. Mtango va Vwasi (Pare). Treatment of wounds (juice).

MENISPERMACEAE

Cissampelos Pareira L. Mlagalaga, Ukuluanti (Nyamwesi); Kigonde (Kishambaa); Ol egisikon (Masai). Head- and rheumatic-pains, sexual stimulant, abdominal pains (root).

Jateorhiza palmata (Lam.) Miers. Kaomwa (Lindi) (Konde); Columbaroot. Dysentery, tonic (root).

Stephania abyssinica Dill. et A. Rich. ex Walp. Mkwamabewa (Chagga). Mild purge for children (leaves).

Trichlisia Saccleuxii (Pierre) Diels. Lusisi (Sukuma); Lusisi, Jusisi, Msisi, Mzizi (Shambaa). Intestinal worms, venereal disease (root).

ARISTOLOCHIACEAE

Aristolochia densivenia Engl. Lunkulwe (Shambaa, Seguha, Sukuma); Tamba ya Nyoka (Suaheli). Antidote for snakebite and for arrow-poisoning, cough cure, sexual stimulant (root).

HYDNORACEAE

Hydnora africana Thunb. Nyambo (Suaheli); E'ruguni (Masai). Throat complaints, quinces (astringent) (root).

PIPERACEAE

Piper capense L.f. Mdeca (Pare). Sexual stimulant, anthelmintic (root).

CAPPARIDACEAE

Boscia coriacea Pax. Names and uses unknown (bark).

B. salicifolia Oliv. Mumjenje (Pare). Febrifuge for cattle (leaves).

Cadaba adenotricha Gilg et Bened. Mtindi, Kibabu (Sukuma). Toxic (fruit).

Capparis persicifolia A. Rich. Mkorapfumu (Chagga). Cough cure (root).

Gynandropsis gynandra Briq. Gagani (Nyamwesi); Muangi (Sukuma). Facilitates birth, internal disorders (root).

POLYGALACEAE

Securidaca longipedunculata Fresen. Nteyo (Nyamwesi); Mbaso, Nengonengo (Sukuma). Syphilis (root); stomachic (root-bark); antidote for snakebite, purge (leaves).

CRASSULACEAE

Kalanchoë glaberrima Volkens. Name unknown. Contusions (leaves).

Kalanchoë sp. Imbogo (Chagga). Galactagogue for cattle (leaves).

CARYOPHYLLACEAE

Drymaria cordata Willd. Ukiko, Maramakura (Chagga). Headache (leaves).

MOLLUGINACEAE

Gisekia pharnaceoides L. Mulandega (Syaheli). Diarrhoea (whole plant).

PORTULACACEAE

Portulaca quadrifida L. Lingoe (Nyamwesi). Prevention of miscarriage (whole plant).

POLYGONACEAE

Oxygonum atriplicifolium Mart. var. *sinuatum* Bak. Mbivinu (Chagga). Cough cure (leaf-juice).

Rumex abyssinicus Jacq. Iweriweri (Chagga); En gaisedjoi Kitok (Massi). Cough cure (leaf-juice).

R. maderensis Lowe. Irearemu (Chagga). Eye drops (leaf-juice).

R. nepalensis Spreng. Kiweriweri (Chagga). After-throes, treatment of abscess (root).

PHYTOLACCACEAE

Phytolacca dodecandra L'Herit. Ibasa, Ingorosoi (Chagga); Hoko (Sukuma). Styptic and healing, disinfectant of wounds, internal poison excitant (juice).

CHENOPODIACEAE

Chenopodium Botrys L. Kwima. Poison (seeds).

C. opulifolium Schrad. subsp. *ugandae* Aellen. Omari (Jalua). Eye ointment (leaves).

AMARANTHACEAE

Achyranthes aspera L. Pululue (Nyamwesi); Prue (Shambaa); Mdala Sukuma; Ol erbat (Masai). Stitch (root); abscess, boils (leaves).

Celosia trigyna L. Saza (Shambala); Igiri (Bukoba). Anthelmintic (shoots).

OXALIDACEAE

Oxalis corniculata L. Manjenju (Chagga); Kidadeishi (Sukuma). Cough cure (leaves).

BALSAMINACEAE

Impatiens Walleriana Hook. f. Sunguala (Chagga); Tulanange (Sukuma). Liver pains (stems); Abortive (root).

PUNICACEAE

Punica Granatum L. Ngukumaanga (Chagga); Mkomamanga (Suaheli). Anthelmintic (tapeworm) (root).

ICACINACEAE

Apodytes dimidiata E. Mey. Lemo, Luachogo (Jaluo). Inflammation of the ear (leaf).

THYMELAEACEAE

Lasiosiphon Vatkei Engl. Mwata (Pare); Mtelele (Nyamwesi). Purge and poisonous (root).

PASSIFLORACEAE

Adenia globosa Engl. Mpaga (Suaheli). Cattle medicine for purpose unknown (trunk).

A. gummifera Harms. Mandali (Suaheli); Ngole (Sukuma). Antidote for arrow poisoning (root).

CUCURBITACEAE

• *Cucumis myriocarpus* Naud. Ngawayá (Gogo). Uses unknown.

• *Momordica foetida* Schum. Iuru (Chagga). Ear-ache (leaf).

• *M. Schimperiana* Steud. Iuru (Chagga). Ear-ache (leaf); insecticide (fruit).

• *M. umbellata* (Cogn.) Harms. Ol amboshi (Masai). Diaphoretic (juice of root).

Raphanistrocarpus sp. Kkaje (Taita). Part of cure for bubonic plague (root).

Telfairia pedata Hook. Makungú (Chagga); Queme (Shambaa). Tonic after childbirth (seed).

OCHNACEAE

Brackenridgea zanguebarica Oliv. Mōka, Kiogokueka (Nyamwesi). Treatment of wounds, antidote for snakebite (bark).

MYRTACEAE

Syzygium guineense DC. Mzarabo (Rifiji); Msambaran (Suaheli). Dysentery (fruit).

MELASTOMATACEAE

Dissotis rotundifolia Tr. Kiendecheká (Shambaa). Anthelmintic (leaves).

COMBRETACEAE

Combretum Greenwayi Exell. Mulavasi (Nyamwesi). Chest complaints (leaves).

C. Gueinzii Sond. subsp. *splendens* Exell. Mulama, Mlama (Nyamwesi); Mnama (Sukuma). Antidote for snakebite (root, leaves); abortion, constipation (root).

Combretum sp. Musana, Msana (Nyamwesi). Scorpion-bite (leaves).

Combretum sp. Melekera (Nyamwesi). Leprosy (root).

HYPERICACEAE

Hypericum peplidifolium A. Rich. Sungudli (Chagga). Indigestion (leaves).

Psorospermum febrifugum Spach. M kuvagwe (Kiha); Ekchereka (Ikizu). Rashes, eruptions, treatment of wounds (root).

TILIACEAE

- Corchorus olitorius* L. Kala (Suaheli). Tonic (twigs, leaves).
Grewia bicolor Juss. Mkole (Gogo); Mkomakoma (Kiha); Os siteti (Masai). Chest complaints (root).
G. Forbesii Harv. Msokote (Nyamwesi); Mchagi (Sukuma). Lumbago, stiff-neck (root).
G. plagiophylla K. Sch. Mdomoka (Taita). Part of remedy for bubonic plague (root).

STERCULIACEAE

- Dombeya rotundifolia* Harv. Mluati (Seghua). Abdominal pains (root).
Sterculia appendiculata K.Sch. Mfunu (Shambaa). Abdominal pains (purge) (leaf-stalks).

MALVACEAE

- Abutilon indicum* L. Fiéwie (Shambaa). Inflammation of eye (root).
Hibiscus fuscus Garcke. Msindati (Pare). Sexual stimulant (root).
H. micranthus L. Msase, Muambe (Suaheli); Mburi (Sukuma); Ol egogoia (Masai). Kidney-trouble, antidote for snakebite (leaf-juice).

EUPHORBIACEAE

- Acalypha fruticosa* Forsk. Sissi, Izi (Taita); Os siaiti ado (Masai); Mfulwe (Pare, Sukuma). Inflammation of the eye (leaf-juice); gonorrhoea, antidote for snakebite, febrifuge (root).
Acalypha sp. Mufiajianjia (Suaheli). Swellings? (Leaves).
Antidesma venosum E. Mey. Msuaga (Suaheli). Abdominal pains (leaves, fruits, twigs).
Bridelia micrantha Baill. Muesa (Seguha). Headache (root).
B. scleroneuroides Pax. Mulyanyoni (Kiha). Stomach-ache (root).
Croton macrostachys Hochst. ex A. Rich. Ifurufuru (Chagga). Anthelmintic (leaf-juice).
C. megalocarpus Hutch. Ol Marbait, Ol Mergoit (Masai); Lali (Chagga). Anthelmintic, tonic (bark).
C. pseudopulchellus Pax. Mgagana, Mgeigel, Mkuambe (Nyamwesi). Asthma (root); syphilitic ulcer (leaves).
Erythrococca rigidifolia Pax. Kimbumbu (Chagga). Cough cure (leaf-juice).
Euphorbia hirta L. Mziwaziwa (Suaheli); Kiawaame (Sukuma). Gonorrhoea, diuretic, anthelmintic? (whole plant).
E. Schimperiana Scheele. Molotava (Chagga). Purge (root, leaves).
E. Tirucalli L. Utupa, Mwasi, Malangali (Suaheli); Manyara (Dodoma); Ol aile (Masai). Fish poison (latex); said to keep away mosquitoes (tree).
Euphorbia sp. Lumbi (Taita). Purge, anthelmintic (whole plant).
Fluggea virosa Baill. Mkwambwa (Shambaa). Malaria (root).

Mildbraedia fallax Hutch. Mtapatapa mkufua. Chest complaints (root).

Oldfieldia sp. Mpumbombega (Suaheli). Poison (bark, exhalation).

Phyllanthus discoideus Müll. Arg. Lusenga (Suaheli). Ulcers caused by "jigger" burrowing flea (leaves).

P. leucanthus Pax. Kimamruka (Chagga). Activates cicatrisation of umbilical cord (juice from root).

Phyllanthus sp. Munyamachi (Taita). Part of remedy for bubonic plague (root).

Phyllanthus sp. Kilumbo (Seghwa). Gonorrhoea (root).

" " Mriombeke (Chagga). Ulcers, abscess (leaves, fruits).

Pseudolachnostylis maprouneifolia Pax. Mutoto (Kiha). Purge (root).

Ricinus communis L. Igonu (Chagga). Abdominal pains, diarrhoea (root); carbuncles, treatment of wounds (leaves).

Sapium ellipticum Pax. Msharaka (Chambaa). Maggoty wounds (branch).

S. madagascariense Prain. Usungu (Taita, Gariama); Musungu (Shambaa). Ingredient for arrow poison (leaves).

Synadenium sp. Mvunja Kongwa (Suaheli). Fish poison (latex).

S. Volkensii Pax. Maasa (Chagga). Styptic, internal poison (latex); Malaria (root).

ROSACEAE

Hagenia abyssinica Willd. Mwanga, Malaagi (Chagga). Anthelmintic (flowers).

CHAILLETIACEAE

Dichapetalum sp. Ludi (Taita); Duaiu (Sukuma). Poison (leaves, root).

D. Stuhlmanni Engl. Nchenchere (Lindi); Nyenya. Poison (leaves).

CAESALPINIACEAE

Bauhinia Thonningii Schum. Mubamba ngoma (Suaheli); Os sagararam (Masai); Mshindambogo (Nyamwesi); Mtindamboga (Kiha); Mgonambogo Msegese (Shambaa). Gonorrhoea, ankylostomiasis, cough-cure, chest complaints (root).

Cassia alata L. Muambangoma (Shambaa). Wash newly-born children (leaves).

C. angolensis Welw. ex Hiern. Undaunda (Bondei); Mkungwena (Shambaa). Gonorrhoea, cough-cure (leaves).

C. abbreviata Oliv.? Names and parts used unknown. Blackwater.

C. didymobotrya Fresen. Ivinu (Chagga); e Senetoi (Masai). Powerful purge (root); mild purge, fish poison (leaves).

C. fistula L. Mkusingue, Muhumba (Bagamoyo). Blackwater (parts used unknown).

C. singueana Del. Mhumba (Suluma); Msindati (Pare). Toxic (fruit); syphilis (root).

C. Tora L. Names, uses and parts used unknown.

Delonix elata Gamble. Mvutambula (Nyamwesi); Ol donoroinoroi (Masai). Antidote for snakebite (leaves).

Pterolobium exosum Bak. f. Mragangungu (Chagga). Febrifuge (leaves); toothache (root).

MIMOSACEAE

Acacia arabica Willd. Ol Giloriti (Masai); Ol Mumunj. Excitant (bark).

A. Nefasia Schweinf. Ol debessi (Masai). Gonorrhoea (bark).

A. Seyal Del. var. *fistula* Oliv. Ol jerai (Masai). Excitant (bark).

A. usambarensis Taub. Mtugo (Taita). Part of remedy for bubonic plague, malaria (root).

Acacia sp. Kikwessa (Seguha). Sexual stimulant (root).

Albizia anthelmintica Brongn. Ol mokotan (Masai); Mfureta (Chambaa); Mkuta (Chagga); Mpingu (Sukuma). Anthelmintic (root); Sexual stimulant, gonorrhoea, haemorrhage after birth (bark).

A. brachycalyx Oliv. Mlangalanga (Kiha). Rheumatic pains (bark).

A. maranguense Taub. Mfurangshe, Mruka (Chagga). Cough-cure (bark).

A. versicolor Welw. Mduruasi (Suaheli); Mukingu (Seguha); Mkingu (Sukuma). Headache (bark of root); arrow poison?

Dichrostachys glomerata Chiov. Mkulajembe (Suaheli); Mwingano (Chagga); Mtundulu (Nyamwesi); Mkeragembe (Seguha). Antidote for snakebite (leaves); chest complaints, gonorrhoea (root); syphilis.

Entada abyssinica Steud. Mfufuma simba (Seguha). Rheumatic pains (root-bark).

E. phaseoloides (Linn.) Merr. Godogo (Sukuma). Fruit toxic.

E. Stuhlmanni Harms? Munyama (Nyamwesi). Galactagogue (internal and external use) (root).

Erythrophloeum guineëse Don. Muhai (Songea); Mkola (Nyamwesi); Muafi (Suaheli). Ordeal, anthelmintic (bark); antidote for snakebite (leaves).

Mimosa asperata L. Mgeigei (Kiha). "Mbengu" (swelling of limbs without external wounds) (infection) (leaves).

PAPILIONACEAE

Abrus precatorius L. Mtipitipi, Mongaluchi (Suaheli); Kachenche Nyamwesi); Lufiambo (Sukuma). Antidote for snakebite, syphilis (leaves).

Alysicarpus glumaceus DC. Mpakapaka (Suaheli); Silubua (Pare). Veldt sores, thrush (leaves and stalks).

Cajanus Cajan Millsp. Mbalasho (Chagga); Mbaasi (Suaheli). Diarrhoea (leaves); toothache (root).

Crotalaria axillaris Ait. Mposhokwe (Pare). Promotes menses (root).

- C. retusa* L. Mchekeche (Suaheli). Fish poison? (leaves); toxic for fowls? (seeds).
- C. Thomsoni* Oliv. Mteiu (Suaheli). Abdominal pains (leaves).
- C. Zimmermannii* Bak. f. Ol Airashavash (Masai). Toxic for cattle (leaves).
- Dalbergia melanoxydon* Guill. & Perr. Mhingo (Seguha); Mpingo (Suaheli). Abdominal pains (root).
- Desmodium scalpe* DC. Kipuchamdo (Chagga). Abdominal pains (leaves).
- Dolichos pseudopachyrrhizus* Harms. Mhayo (Sukuma). Insecticide (root).
- Erythrina tomentosa* R. Br. ex A. Rich. Ol oboni (Masai); Mriri (Chagga); Mungu (Sukuma). Gonorrhoea, malaria (bark); Toxic (fruit).
- Erythrina* sp. Mkalalohobwe (Nyamwesi). Dropsy (root).
- Indigofera arrecta* Hochst. Wnaganaga, Mhanahana (Chagga). Abdominal pains (root).
- Lonchocarpus Bussei* Harms. Mbale (Nyamwesi, Sukuma); Ol bararuai (Masai). Galactogue, gonorrhoea (root).
- L. eriocalyx* Harms. Muvare (Kiha). Eruptions on skin (root).
- Millettia oblata* Dunn. Mhafa (Sukuma). Bladder troubles (root).
- Mundulea sericea* A. Chev. Utupa ya porini, Mkwaja (Suaheli). Fish poison (bark).
- Ostryoderris Stuhlmanni* Dunn ex Bak. f. Mumundu (Suaheli). Chest complaints (leaves).
- Phaseolus Mungo* L. Chooko, Chirroko (Suaheli). Leprosy, abscess, tumors (seed).
- Pterocarpus Bussei* Harms. Mhagata (Seguha); Miniga (Nyamwesi). Abortive (juice of bark).
- Sophora tomentosa* L. Names unknown. Fish poison (part used unknown).
- Tephrosia Vogelii* Hook. f. Utapa (Suaheli). Fish poison, abortion (leaves).
- Vigna unguiculata* Walp. Kunde (Suaheli). Toxic antidote for snakebite (root).

MYROTHAMNACEAE

- Myrothamnus flabellifolia* Welw. Chanassa (Songea). Chest complaints, tonic (leaves).

MYRICACEAE

- Myrica kilimandscharica* Engl. Mpache (Chagga); Ol getalasua (Masai). Abdominal pains, indigestion (root).
- M. Meyeri-Johannis* Engl. Mpache (Chagga). Abdominal pains, indigestion (root).

ULMACEAE

- Trema guineensis* Ficalho. Mgendagenda (Suaheli); Mwesi (Chagga). Pleurisy (leaf, fruit); toxic for goats (leaf).

MORACEAE

- Cardiogyne africana* Bureau. Mnembua (Nyamwesi). Lumbago (latex).

Ficus capensis Thunb. Mkuu (Chagga). Galactagogue (external bark).

F. natalensis Hochst. Munangara (Ikizu). Antidote for snakebite (root).

F. Sycomorus L. Ol nanboli (Masai). Diarrhoea (bark).

F. Vogelii Miq. Mtemboe (Chagga). Styptic and healing (latex).

URTICACEAE

Fleurya lanceolata Engl. Chuata (Shambaa). Toothache (juice).

Obetia pinnatifida Baker. Chuata (Shambaa); Puputishe (Sukuma). Toothache, protection against rats (leaves).

RHAMNACEAE

Rhamnus prinoides L'Herit. Mshimbanumba (Chagga); Ol gonjel (Masai). Colics (root).

Rhamnus sp. Ol kokola (Masai). Gonorrhoea (root).

CELASTRACEAE

Catha edulis Forsk. Mandama (Shambaa); Mira (Kikuyu). Intoxicant, tonic (leaves).

Elaeodendron sp. Mgakama (Nyamwesi). Ulcerations, carbuncles (root).

Gymnosporia putterlickioides Loes. Mkuanga (Shambaa). Rescinds retching (root).

Gymnosporia sp. Mweza. Diarrhoea, febrifuge (root).

Gymnosporia sp. Mibwasungu (Nyamwesi). Antidote for snakebite (bark).

SALVADORACEAE

Azima tetracantha Lam. Mwelewele (Nyamwesi); Ndewe (Suaheli). Antidote for snakebite (root and leaves).

Salvadora persica Garcin. Msuake (Suaheli); O-remit (Masai). Ankylostomiasis, mustard plaster, gonorrhoea, bladder troubles and pains of spleen (root).

OLACACEAE

Ximenia americana L. Mtundua (Nyamwesi); Mpingi (Sukuma); Lama (Chagga); Ol ama (Masai). Febrifuge, diarrhoea (root).

SANTALACEAE

Osyris tenuifolia Engl. Ol asasiai (Masai); Liwa, Nzulu (Shambaa). Gonorrhoea, rheumatic pains, galactagogue, tonic (root).

AMPELIDACEAE

Cissus adenocaulis Steud. Mwengele (Suaheli); Muengere (Sukuma). Remedy for "dulasi" [an infectious disease amongst the coast natives], abscess, carbuncles, prevents abortion (root).

C. Hildebrandtii Gilg. Msango (Shambaa). Antidote for snakebite and for arrow-poisoning (juice).

C. Oliveri Gilg. Mkaanchu (Chagga); Nyotambidi (Suaheli); Ol eramtam (Masai). Remedy for "dulasi" (root); constipation (leaves).

C. quadrangularis L. Os sugurtuti, Ol dinai (Masai); Kihindihindi (Sukuma); Numa (Kerewe); O'rarait (Masai). Ulcerations, treatment of wounds (leaves); myalgic pains (root); earache (juice).

Rhoicissus erythroides Planch. Ol egilena, Ol gilenyai (Masai). Excitant, gonorrhoea (root); treatment of wounds (juice).

RUTACEAE

Fagara amaniensis Engl. Mfuakumbi (Shambaa). Toothache (bark).

F. olitoria Engl. Mnugunungu (Nyamwesi); Genjeka (Taita). Facilitates delivery, part of remedy for bubonic plague (leaves).

Teclea amaniensis Engl. Miense (Suaheli). Headache (bark).

T. nobilis Delile. Mdimu (Nyamwesi). Gonorrhoea (bark).

T. simplicifolia Verdoorn. Ol gelai (Masai). Gonorrhoea, tonic (root); pneumonia (leaves).

Toddalia asiatica Lam. Ol eragudj, Ol aiseramai (Masai); Mkananga (Chagga); Mdongo nyesi (Sukuma). Cough-cure (fruits); indigestion, influenza (root).

T. sansibarensis Engl. Msjepasjepa (Suaheli). Antidote for snake-bite (root-bark).

SIMARUBACEAE

Balanites aegyptiaca Delile. Muambangoma (Nyamwesi); Mkonga (Morogoro). Fish poison (fruit, bark).

B. glabra Mildbr. & Schltr. Name unknown (Seguha). Internal poison (bark).

Brucea antidysenterica J. F. Miller. Mrikanwandu (Chagga). Abdominal pains (leaves, root).

Harrisonia abyssinica Oliv. Ol dungui, en gulelo (Masai); Msoma, Mgowole (Suaheli); Mkussu (Sukuma); Pedo (Jaluo); Chungue (Taita). Ankylostomiasis, anthelmintic, part of the remedy for bubonic plague (root); piles, antidote for snakebite (leaves).

BURSERACEAE

Boswellia Carteri Bird. Ubani (Suaheli). Diuretic (resin).

Boswellia sp. Muhodja (Nyamwesi). Gonorrhoea (root).

Commiphora Boiviniana Engl. Mburusigi (Seguha). Dysentery (bark).

C. pilosa Engl. Mponda (Nyamwesi). Antidote for snakebite (leaf and root).

C. Zimmermannii Engl. Mfifina (Chagga). Toothache (leaf-stalks); indigestion (bark).

Commiphora sp. Mumuongo, Muongo (Nyamwesi). Antidote for snakebite (bark).

Commiphora sp. Angiani (Masai). Disinfectant for wounds (resin).

MELIACEAE

Turraea sp. Nyakururu (Ikizu). Abdominal pains (root).

SAPINDACEAE

- Allophyllus alnifolius* Radlk. Bangue (Nyamwesi). "Dulasi" (root).
Deinbollia sp. Mkarye (Kiha). Chest complaints (root).
Pappea ugandensis Bak. f. Ol dimigomi (Masai); Mubamba ngoma (Suaheli). Tonic, sexual stimulant, chest complaints (bark).
Zanha golungensis Hiern. Mkália (Nyamwesi). Chest complaints (bark).

MELIANTHACEAE

- Bersama paullinioides* Baker. Mrandangube (Chagga); Mrindawa. Aperient, anthelmintic (bark).

ANACARDIACEAE

- Heeria mucronata* Bernh. Mkalakala, Mwelewele (Nyamwesi). Dysentery (root); antidote for snakebite (juice of leaves).
H. reticulata (Bak. f.) Engl. Muhva (Kiha); Mwalika, Zabibu ya mwitu (Suaheli); Mkalakala (Seguha); Mkala (Sukuma); Nambono (Tunduru). Galactagogue, sexual stimulant (root); pink-eye (bark).
Lannea edulis (Sond.) Engl. Tribal names unknown. Dysentery (root).
L. Kirkii Burtt-Davy. Mtundu (Suaheli). Antidote for snakebite (root).
L. Stuhlmanni (Engl.) Engl. Mnyumbu (Nyamwesi). Abscess, carbuncle (leaves).
Rhus natalensis Bernh. Msagara (Kiha); Ol mesigie (Masai); Mhunguru (Sukuma). Gonorrhoea, influenza, treatment of wounds (root).

ARALIACEAE

- Cussonia arborea* Hochst. Kihondogoro (Kiha); Yagi ya nsovu (Sukuma). Gonorrhoea, vapour bath (root).

UMBELLIFERAE

- Steganotaenia araliacea* Hochst. Mogura (Seguha); Mogola (Sukuma). Sore throat (root); asthma (bark).

ERICACEAE

- Agauria salicifolia* Hook. f. Mgagana (Chagga). Toxic for cattle, insecticide, antidote for arrow-poisoning, healing ointment (leaves).

EBENACEAE

- Euclea fructuosa* Hiern. Os sodjo, Ol ginje (Masai); Mdala (Shambaa, Sukuma); Muenya (Nyamwesi). Ankylostomiasis, Yaws—external (root); splenic swellings (root and bark).

SAPOTACEAE

- Mimusops* sp. Mtsheidji (Nyamwesi). Chest complaints (root).

MYRSINACEAE

- Embelia kilimandscharica* Gilg. Gezi (Chagga); Os sumategi (Masai). Anthelmintic (fruit).

Embelia sp. Ol jani njugi, Ol chani onyokye (Masai). Anthelmintic (bark).

Maesa lanceolata Forsk. Ol odoa, Ol onorua (Masai). Anthelmintic, aperient (fruit).

Rapanea rhododendroides Mez. Kirjasi (Chagga). Anthelmintic (fruit).

R. usambarensis Gilg. Mshiro (Sukuma). Aperient (root).

Rapanea sp. Karombaria (Kikuyu). Anthelmintic (fruit).

LOGANIACEAE

Strychnos pungens Solered. Mkole (Suaheli). Antidote for snakebite (part used unknown).

S. spinosa Lam. Mpapa (Suaheli) ; Mubale (Nyamwesi). Antidote for snakebite (part used unknown).

S. Volkensii Gilg. Moage, Muage (Nyamwesi). Antidote for snakebite, dropsy (root).

S. Wakefieldii Baker. Muhonsia (Nyamwesi). Obstetrics (bark).

Strychnos sp. Mkangara (Shambaa). Chest complaints (root).

OLEACEAE

Jasminum mauritianum Boj. Muafu (Nyamwesi) ; Mandale (Sukuma). Antidote for snakebite (bark of root) ; toxic (root).

Linociera Welwitschii Baker. Ol loliondo (Masai) ; Mshihio (Chagga). Gonorrhoea (bark).

APOCYNACEAE

Acokanthera Friesiorum Markgraf. Obosongo (Kkizu). Arrow-poison (root).

A. longiflora Stapf. Ol Morijoi (Masai). Arrow-poison (branches).

Adenium coetaneum Stapf. Mayanga (Shambaa). Arrow-poison, fish-poison, internal poison (branches).

Carissa edulis Vahl. Mfudje-anje (Nyamwesi). Chest complaints (root).

Conopharyngia Holstii Stapf. Mkomba (Chagga). Styptic (latex).

Diplorhynchus mossambicensis Benth. Mtogo (Seguha). Mbelembele (Nyamwesi). Facilitates delivery of child, antidote for snakebite (bark of root).

Landolphia Petersiana Dyer. Mtambaanche, Mbohoya (Nyamwesi) ; Mpera ya porini (Suaheli). Antidote for snakebite (twigs and fruit) ; colics (root).

L. parvifolia K. Sch. Mbungobungo (Jaluo). Arrow-poison (parts used unknown).

Rauwolfia inebrians K.Sch. Mesesewe, Msewesewe (Chagga). Styptic (latex ; intoxicant (bark).

Strophanthus Courmontii Saccl. Bohora (Sukuma). Toxic (seeds).

S. Eminii Aschers. et Pax. Mtolo, Mtowo (Uhehe) ; Mtungululu (Nyamwesi) ; Msungulu (Suaheli) ; Mweriweri (Gogo). Arrow-poison (tubers, root).

ASCLEPIADACEAE

Gymnema sylvestre R. Brown. Tribal names unknown. Stupefies faculty for tasting sweetness (leaves).

Sarcostemma viminalis R. Br. Ol dewo (Masai). Thirst-relieving (stem).

Schizoglossum shirens N.E.Br. Uzara (Nyamwesi). Dysentery, stomachic, sexual stimulant (whole plant).

Stapelia Dummeri N.E.Br. Kaulira (Baganda). Earache (juice).

RUBIACEAE

Borreria compacta K. Sch. Wazanaki (Ikizu). Mustard-plaster (leaves).

Crossopteryx febrifuga Benth. Msandjwambeke, Msasambeke (Nyamwesi). Syphilitic ulcer (bark of root); inflammation of eye (leaves).

Randia vestita S. Moore. Mochangoka (Nyamwesi); Mdyassa (Seguha). Aperient, indigestion, gonorrhoea (root).

Hymenodictyon parvifolium Oliv. Mimbiti (Shambaa); Mrinditi (Nyamwesi, Pare). Kidney trouble, convulsions (root); inflamed eye (leaves).

Mussaenda sp. Obinju (Jaluo). Myalgic pains (leaves).

Mussaenda sp. Achak, Anyoka (Jaluo). Abdominal pains (leaves and bark).

Oldenlandia Bojeri Hiern. Mkuku pingua (Nyamwesi). Antidote for snakebite (leaves).

O. globosa Hiern. Akazibango (Urundi). Piles (whole plant).

O. Johnstoni Oliv. Singiambewa (Chagga). Diarrhoea (leaf-juice).

Pavetta canescens DC. Munyamyenda (Kiha). Sore throat (bark).

Pentanisia uranogyne S. Moore. Munyapome (Shambaa). Abdominal pains (root).

Pentas purpurea Oliv. Nzimasi (Pare); Ol enjorio, Ol iogiono (Masai). Promotes menses (root); febrifuge, rheumatic pains, headache (juice).

Rytigynia Schumannii var. *Uhligii* Robyns. Kiviroe (Chagga). Pleurisy, rheumatic pains (leaf).

Vangueria apiculata K. Sch. Mgugunwa (Kiha). Anthelmintic (root).

V. tomentosa Hochst. Mtiegu, Viru (Suaheli); *Mvilu* (Shambaa); Ndaria (Pare). Smallpox—external (leaves); anthelmintic (root).

COMPOSITAE

Ageratum conyzoides L. Ipfuna (Chagga); Ol orowil el aijok (Masai). Abdominal pains (root).

Artemisia afra Jacq. Fifi (Sukuma). Cough-cure (whole plant).

Aspilia Holstii O. Hoffm. Mshayasha ngozo (Pare); Njanganjangala (Shambaa). Lumbago, sciatica, neuralgic pains (root).

Blepharispermum zanguibaricum Oliv. & Hiern. Mlanga (Shambaa). Dropsy (root).

Dicoma anomala Sond. Usara. (Tribe unknown). Dysentery (root).

Emilia sagittata DC. Mchekacheke (Suaheli); Puishi (Sukuma). Pink-eye (juice); colics—Babies (root).

- Gynura crepidioides* Benth. Prisi (Shambaa). Stryptic—bleeding from the nose (leaves).
Helichrysum Hochstetteri Hook. f. Ikovi, Kichameri (Chagga). Abdominal pains, heartburn (leaves).
Microglossa oblongifolia O. Hoffm. Maashu (Shambaa); Ol desa (Masai): Toothache (leaves).
Senecio Stuhlmannii Klatt. Mbusunga (Shambaa). Ulcerations (leaves).
S. subscandens Hochst. Baranjaamba (Chagga); Mguene (Shambaa); En dule (Masai); Hosa (Seguha); Nyengesa (Sukuma). Abdominal pains, convulsions, fever, toothache, cancer, antidote for ? (leaves).
Sonchus oleraceus L. Mshunga (Pare). Anthelmintic (root).
Spilanthus Acmella L. Usoro, Isingamanayego (Chagga); Ekum (Masai). Toothache, febrifuge, sore throat (whole plant).
Vernonia cinerea Less. Lupia (Suaheli). Stomachic (leaves and flowers).
V. iodocalyx O. Hoffm. Mhasha (Shambaa); Mnyatira (Sukuma). Epileptic fits, indigestion, facilitates birth (whole plant).
V. podocoma Schultz. Iruru (Chagga); Ndulusya (Konde). Purge for cattle (leaves); styptic, healing fish poison (juice).
Vernonia sp. Msimamongo (Tiata). Stomachic (leaves).
Vernonia sp. Ol Mobasa (Masai). Gonorrhoea (root).

BORAGINACEAE

- Cordia Gharaf* Ehrenb. Ol durgo (Masai). Inflammation of eye—cattle, abortion (root).
C. ovalis R. Br. Magomosi (Shambaa). Leprosy (bark).
C. quarensis Guerke. Os segi (Masai). Abortion (root).
Ehretia silvatica Guerke. Mnemvu, Yambu (Chagga). Styptic, healing (juice).

SOLANACEAE

- Capsicum frutescens* L. Kamlar (Jaluo). Bubonic plague—external (leaves).
Datura fastuosa L. Tribal names unknown. Intoxicant (seed, root); Poison (leaves).
Solanum Bojeri Dun. Amatoborwa (Kerewe). Ulcerations (leaves).
S. incanum L. Nduo (Chagga); Mtungújamito, Mtungusa (Nyamwesi); Ntula (Sukuma). Abdominal pains, liver troubles, carbuncle (root); antidote for snakebite (fruit); earache (gallnuts).
S. nodiflorum Jacq. Muyanya porini (Suaheli). Abscess, ulcerations, carbuncle (leaves).
Withania somnifera Dun. Kuvia (Nyamwesi); Dambarico (Pare); Mgeda (Sukuma); Ol asajet (Masai). Sexual stimulant, abortifacient, pink-eye (root).

CONVOLVULACEAE

- Merremia angustifolia* Hall. f. Migwasungu (Nyamwesi). Antidote for snakebite (leaves).

OROBANCHACEAE

Cistanche tinctoria (Forsk.) G. Beck. Gingiadiu (Pare). Abscess, carbuncle, sore throat (root).

BIGNONIACEAE

Kigelia aethiopica Decne. Masina (Taita); Melegea (Bondei); Ol darboi (Masai); Mvungue (Seguha). Intoxicant, sexual excitant, treatment of wounds (fruit).

Markhamia obtusifolia Sprague. Mkola (Kiha); Mtarawanda (Sukuma). Convulsions, against barrenness (root).

Stereospermum Kunthianum Cham. Munyeresanguge (Kiha). Cough-cure (pod).

PEDALIACEAE

Sesamum angustifolium Engl. Mlinga (Mwansa); En delemet (Masai). Burns (juice).

ACANTHACEAE

Thunbergia sp. Kiseranginda (Chagga). To ease afterpains (leaf-juice).

Asystasia gangetica T. And. Kichwamangwo (Suaheli). Antidote for snakebite (leaves).

VERBENACEAE

Clerodendron Johnstoni Oliv. Shimbo, Ukandra, Ikwandira (Chagga). Expectorant (leaves).

C. myricoides Hochst. Ol Mokodat (Masai). East coast fever [cattle] (bark of root).

Lantana salviifolia Jacq. Mtululu (Suaheli). Ol marigireni, Os sinoni (Masai). Galactogogue (leaves).

Vitex amboniensis Guerke. Mtalali (Suaheli). Antidote for snakebite (whole plant).

V. chrysoclada Boj. Majimaji (Suaheli). Ulcerations? (leaves).

LABIATAE

Coleus kilimadschari Guerke. Mfureta (Chagga). Stomachic (leaves).

Coleus sp. near *C. kilimandschari*. Barakuva, Batakuva (Suaheli). Abortifacient (leaves).

Fuerstia africana Th. & C. E. Fries. Kimamúhu, Kimamho (Chagga). Malaria, aperient, anthelmintic ankylostomiasis (whole plant).

Coleus sp. Kitolo (Chagga). Treatment of wounds (juice).

Hoslundia opposita Vahl. Munjinua, Mswele (Nyamwesi), Mkalula, Mshelele (Sukuma). Abdominal pains (root); swellings ["dulasi"], antidote for snakebite (leaves).

H. verticillata Vahl. Tribal names unknown. Febrifuge (root, leaves).

Hyptis pectinata Poit. Osandogue, Hoza ndogoi (Shambaa). Congestion of respiratory organs, stomachic (leaves).

Leonotis mollissima Guerke. Irengue (Chagga); Muhasi (Sukuma). Treatment of veldt sores (root); antidote for snakebite (leaves).

- Micromeria abyssinica* Benth. Kimamsico, Kibeje (Chagga).
Bronchitis, febrifuge (leaves).
Moschosma multiflorum Benth. Gombo (Chagga); Ol magingi
(Masai). Cough-cure (root, leaves); flatulence (root).
Ocimum americanum L. Pupu (Chagga); Kinuka (Suaheli);
Msumbampungu (Sukuma). Bilharziosis, antidote for snake-
bite (leaves).
Plectranthus elegans Britten. Domondo (Shambaa). Sore throat
(leaves).

MONOCOTYLEDONES

COMMELINACEAE

- Commelina benghalensis* L. Ikengera (Suaheli); Kafura (Sukuma).
Thrush (juice from calyx).

FLAGELLARIACEAE

- Flagellaria guineënsis* Schum. Mtiba (Suaheli); Kilonga masi,
Kisulumuto (Seguo). Skin-diseases and veldt sores (whole
plant).

ZINGIBERACEAE

- Costus* sp. Tungu (Bondei). Anthelmintic (stalks).

LILIACEAE

- Aloë* sp. Losa (Shambaa); Losa (Sukuma). Ulcerations (juice).
A. Volkensii Engl. Mradune (Chagga); Os suguroi (Masai).
Burns (juice).
Asparagus africanus Lam. Lwafumbo (Taita); Em bere e baba
(Masai). Part of remedy for bubonic plague (root).
A. falcatus L. Mulabange, Mwinikanguru (Suaheli); Mungui
(Sukuma). Syphilitic ulcer [external] (root and leaves);
anthelmintic? (leaves).
Asparagus sp. near *A. racemosus* Willd. Schumbue (Pare). Bilhar-
ziosis (root).

ARACEAE

- Gonatopus Boivinii* Hook. f. Kussuguru (Shambaa); Shuguru
(Sukuma). Dropsy (root).
Zamioculcas Loddigesii Schott. Ngulukesi (Sukuma). Ulcerations
(root).

DIOSCOREACEAE

- Dioscorea bulbifera* L. Ndu (Chagga); Ndiga (Sukuma). Pink-eye
(leaves).

AMARYLLIDACEAE

- Crinum Kirkii* Baker. Kititi (Sukuma). Aperient, toxic (root).

AGAVACEAE

- Dracaena fragrans* (L.) Saccl. Rumbasale (Chagga). Abdominal
pains, to ease after-pains (root).
D. Steudneri var. *kilimandscharica* N. E. Br. Masale (Chagga);
Masai (Taita). Flatulence (leaves).
Sansevieria Kirkii Baker. Mkonge (Nyamwesi). Foot sores (root).

GRAMINEAE

- Melinis minutiflora* P. Beauv. Kifuta (Uganda) ; Upatu (Bondei).
Insecticide (whole plant).
Panicum trichocladum Hack. Soromota, Kokoo (Chagga) ; Mkoko
(Sukuma). Antidote for poisoning with *Synadenium Volkensii*
(juice).
Pennisetum clandestinum Hochst. Uzuu, Chikoko (Chagga). Styptic
(whole plant).
Sporobolus indicus var. *tenacissimus* A. Peter. Igeri, Ikeri (Chagga) ;
Ol erigeru, Ol bulugai (Masai). Styptic (whole plant).

III—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM XLI.*

***Ardisia alata* Fletcher** [Myrsinaceae—Eumyrsineae] ; *A. porosae*
C. B. Clarke affinis sed foliis maioribus, petiolo alato, panícula
minore puberula, floribus glandulosioribus differt.

Frutex circa 0.3 m. altus (ex *Kerr*) ; ramuli crassi, primo puberuli,
mox glabrescentes, brunnei. *Folia* oblongo-elliptica, apice obtusa,
basi valde attenuata in petiolum decurrentia, 25–35 cm. longa,
8–10 cm. lata, chartacea vel subcoriacea, supra grisea subtus pallid-
iora, utrinque glabra glandulosa, punctulis bene prominulis, costa
supra conspicua vel leviter impressa subtus prominente, nervis
lateralibus 10–12-paribus subtus prominulis parallelis intra marginem
arcuatis, margine integra valde recurva, petiolo alato circa 1 cm.
longo canaliculato glabro suffulta. *Inflorescentia* terminalis, pendula,
minute ferrugineo-puberula, racemosa, circa 5 cm. longa ; pedicelli
ad 3 mm. longi. *Sepala* basi breviter coalita, ovata, 2 mm. longa,
1.75 mm. lata, dorso sparse puberula, bene glandulosa, ciliolata.
Corolla punicea (ex *Kerr*) 4 mm. longa ; lobi ovati, 3 mm. longi,
2 mm. lati, valde punctati. *Stamina* 2.5 mm. longa, antheris subses-
silibus acutis dorso eglandulosis. *Ovarium* globosum, 1 mm. diametro,
glandulosum ; stylus 3–4 mm. longus.

Takuapa, Kapong, c. 100 m., by stream in evergreen forest,
Kerr 17125.

This species, unlike so many *Ardisias*, has definite characters.
Although its nearest relationship is with *A. porosa* C. B. Clarke,
it stands quite distinct from that species and from all others in the
subgenus *Acrardisia* Mez.

***Ardisia aprica* Fletcher** [Myrsinaceae—Eumyrsineae] ; *A. litorali*
Andr. affinis sed inflorescentia haud simplicissime racemosa, sepalis
pedicellisque minoribus differt.

Frutex circa 20 cm. altus (ex *Kerr*) ; ramuli crassi, rugosi, glabri,
brunnei vel rubro-brunnei. *Folia* elliptica vel obovata, apice obtusa
vel rotundata, basi attenuata, 6–15 cm. longa, 3–6 cm. lata, coriacea,
supra grisea vel griseo-brunnea, subtus pallidiora, utrinque glabra,
glandulosa, punctulis bene prominulis, costa supra subconspicua

* Continued from K.B. 1936, 47.

subtus prominente, nervis lateralibus 6-8-paribus subtus prominulis parallelis intra marginem arcuatis, margine integra, leviter recurva, petiolo 5-10 mm. longo crasso supra canaliculato glabro suffulta. *Inflorescentia* axillaris, glabra, ex umbellis racemiformiter dispositis constituta; pedunculi 5-10 mm. longi; pedicelli 2-4 mm. longi, glandulosi. *Sepala* basi breviter coalita, ovata, 1-1.5 mm. longa, 1.5 mm. lata, apice obtusa vel subrotundata, glabra, glandulosa, ciliata. *Petala* punicea (ex *Kerr*) ovata, 5.5 mm. longa, 2.5-3 mm. lata, glandulosa. *Stamina* 4 mm. longa, antheris 3.5 mm. longis apice acutis dorso valde punctatis. *Ovarium* globosum 1.5 mm. diametro; stylus 4 mm. longus. *Bacca* globosa, circa 6 mm. diametro, conspicue glandulosa.

Chaiyapum, Chaturat, c. 200 m., covering large areas of open ground, *Kerr* 19941.

***Ardisia attenuata* Wall. var. *pubescens* Fletcher** [Myrsinaceae—Eumyrsineae]; a typo ramulis pubescentibus differt.

Prachuap, Hui Yang, under 50 m., by stream in evergreen forest, *Kerr* 10762.

***Ardisia betongensis* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. chrysophyllifoliae* King et Gamble affinis sed pedicellis pedunculisque longioribus differt.

Arbor circa 12 m. alta (ex *Kerr*); ramuli teretes vel obtuse quadrangulares, pilosi vel paene glabri, brunnei. *Folia* elliptica vel oblongo-elliptica, apice obtusa vel subacuta, basi valde cuneata, 7-15 cm. longa, 2-4.5 cm. lata, chartacea, utrinque viridi-brunnea, nitida, glabra, glandulosa, costa supra impressa subtus prominente, nervis lateralibus numerosis parallelis prominulis, margine integra, revoluta, petiolo circa 10-12 mm. longo supra canaliculato leviter alato sparse piloso suffulta. *Inflorescentiae* pauciflorae simplicissimae perabbreviataeque petiolos aequantes, umbellatae vel corymbosae, pedicellis gracilibus circa 10 mm. longis puberulis. *Flores* ante anthesin obtusi 3 mm. longi. *Sepala* basi breviter coalita, ovata vel ovato-oblonga, dorso puberula, margine minutissime ciliolata. *Petala* alba (ex *Kerr*) basi brevissime connata, ovata, 3-3.5 mm. longa, 3 mm. lata, apice obtusa, sparse glandulosa. *Stamina* petalis aequalia; filamenta 1 mm. longa; antherae 2.5 mm. longae apice tenuiter acuminatae haud punctatae. *Ovarium* ovoideum, 1 mm. diametro, glabrum.

Betong, Gunong Ina, c. 1100 m., evergreen forest, *Kerr* 7598.

This plant with its axillary inflorescences shorter than the petiole clearly belongs to the section *Pimelandra* (A.DC.) Mez.

***Ardisia Collinsae* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. pendulae* Mez affinis sed sepalis pedicellisque minoribus differt; nec non *A. penduliflorae* Pitard affinis sed pedicellis petiolisque minoribus, gemma terminali vegetativa puberula et glandulosa, nec glabra et eglandulosa differt.

Frutex circa 4 m. altus (ex *Kerr*); ramuli teretes, primo puberuli, mox glabri, rugosi, brunnei vel griseo-brunnei. *Folia* elliptica vel oblongo-elliptica, apice acuta vel subacuta, basi cuneata, 12–25 cm. longa, 4–7 cm. lata, chartacea vel subcoriacea, supra brunnea, viridi-tincta, subtus pallidiora, utrinque glabra, lepidibus minutissimis peradpressis consita, glandulosa, costa supra impressa subtus prominente, nervis lateralibus 10–12-paribus supra subconspicuis subtus prominulis, margine integra, petiolo circa 5 mm. longo supra canaliculato sparse puberulo vel glabro suffulta. *Inflorescentia* lateralis, racemosa, pendula, ad 10 cm. longa, submultiflora, ferrugineo-puberula; pedicelli ad 1 cm. longi. *Sepala* basi breviter coalita, late ovata, apice rotundata, 2 mm. longa, 2 mm. lata, dorso puberula, glandulosa, margine valde ciliata. *Corolla* 6 mm. longa; lobi late ovati, 5 mm. longi, 3–4 mm. lati, obtusi, valde punctati. *Stamina* 4 mm. longa, antheris subsessilibus acutis dorso valde punctatis. *Bacca* immatura, globosa, circa 5 mm. diametro, rubro-glandulosa.

Kaw Chang, Klawng Kloi, c. 20 m., evergreen forest, *Kerr* 9258. Near Sriracha, c. 5–10 m., *Mrs. D. J. Collins* 1822, 1973. Between Sriracha and Nawng Kaw, *Mrs. D. J. Collins* 460 (*type*).

***Ardisia cordulata* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. odontophyllae* Wall. affinis sed foliis basi rotundatis vel cordulatis nec valde attenuatis, inflorescentia corymbosa nec paniculata differt.

Frutex circa 50 cm. altus (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, juventute puberuli, mox glabri, brunnei. *Folia* elliptica vel leviter obovata, apice longius acuta, basi rotundata vel cordulata, 10–15 cm. longa, 4–6 cm. lata, membranaceo-chartacea, supra griseo-viridia subtus pallidiora, supra juventute longius puberula mox glabra, subtus longius adpresso-puberula, glandulosa, nervis supra leviter impressis, costa subtus prominente, nervis lateralibus circa 10–12-paribus subtus prominulis intra marginem arcuatis, margine fimbriato-denticulata, petiolo 1–4 cm. longo supra canaliculato primo piloso mox puberulo suffulta. *Corymbi* laterales usque ad 2 cm. diametro; pedunculi 3–5 cm. longi puberuli; pedicelli 5–8 mm. longi, graciles, apicem versus paullo incrassati, puberuli. *Sepala* basi breviter coalita, ovata, 1.75 mm. longa 1 mm. lata, extra puberula, valde ciliolata, paucipunctata. *Petala* basi breviter connata, ovata vel ovato-oblonga, 3.5 mm. longa, 2 mm. lata, apice obtusa vel rotundata, valde glandulosa. *Antherae* 2.75 mm. longae acutae dorso haud punctatae filamentis brevissime sed manifeste corollae affixis. *Ovarium* globosum 1 mm. diametro, glandulosum; stylus 4 mm. longus.

Pattani, Betong, c. 600 m., evergreen forest by stream, *Kerr* 7902.

***Ardisia cordulata* Fletcher var. *adpresso-hirsuta* Fletcher** varietas nova; nervis adpresso-hirsutis nec adpresso-puberulis, pedunculis minoribus a typo recedit.

Pattani, Bukit, *Put* 3612.

***Ardisia cordulata* Fletcher var. *patulo-hirsuta* Fletcher**, varietas nova altera nervis patulo-hirsutis pedunculis minoribus a typo differt.

Trang, Kao Soi Dao, c. 800 m., evergreen forest, *Kerr* 19200.

***Ardisia eglandulosa* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. tenerae* Mez affinis sed pedicellis brevioribus, floribus baccisque minoribus, corolla eglandulosa differt.

Frutex; ramuli teretes vel obtuse quadrangulares, rugosi, glabrescentes, cortice brunneo vel cinereo obtecti. *Folia* lanceolata vel leviter oblanceolata, apice obtusa vel subacuta, basi cuneata, 6–12 cm. longa, 1.5–3 cm. lata, chartacea, supra brunnea, viriditincta, subtus pallidiora, utrinque glabra, glandulis minutis translucidis vestita, subtus lepidibus minutissimis ferrugineis peradpressis consita, costa supra impressa subtus prominente, nervis lateralibus numerosis parallelis utrinque obscuris vel leviter subprominulis, margine integra recurva, petiolo 5–10 mm. longo supra canaliculato glabro suffulta. *Inflorescentiae* laterales, pauciflorae, ex umbellis paucis corymbosim compositae, sparse puberulae vel glabrae; pedicelli ad 5 mm. longi. *Sepala* basi breviter coalita, ovata, 1 mm. longa, 0.75 mm. lata acuta, ciliata, eglandulosa. *Corolla* 4 mm. longa; lobi ovati, 3 mm. longi et lati, eglandulosi. *Stamina* 2 mm. longa, antheris valde acuminatis dorso sparse punctatis. *Ovarium* ovoideum, 1 mm. diametro; stylus 4 mm. longus. *Bacca* subglobosa circa 5 mm. diametro.

Korat, Kao Lêm, *Put* 3519 (*type*). Nakawn Sritamarat, Kao Luang, c. 1750 m., *Dr. Eryl Smith* 739.

The Kao Luang plant, represented by a small twig only, has a larger inflorescence than the Korat plant and when further material be available it may prove to be a distinct species.

***Ardisia ferrugineo-pilosa* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. cymosae* Blume affinis sed floribus eglandulosis differt; nec non *A. pedunculosa* Wall. affinis sed inflorescentia pilosa nec glabra, floribus minoribus differt.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli teretes vel obtuse quadrangulares, rugosi, primo ferrugineo-pilosi, mox glabri, cortice brunneo vel cinereo obtecti. *Folia* elliptica vel leviter oblongo-elliptica, apice obtusa, basi cuneata, 10–20 cm. longa, 3.5–6 cm. lata, chartacea, grisea vel griseo-brunnea, utrinque glabra, glandulosa punctulis bene prominulis, subtus lepidibus minutissimis ferrugineis peradpressis consita, costa supra subconspicua vel leviter impressa, subtus prominente, nervis lateralibus numerosis parallelis utrinque prominulis, margine integra leviter recurva, petiolo 1–1.5 cm. longo supra canaliculato puberulo vel glabro suffulta. *Inflorescentiae* laterales, submultiflorae, ex umbellis paucis corymbosim compositae, ferrugineo-pilosae; pedunculi circa 15 mm. longi; pedicelli ad 10 mm. longi. *Sepala* basi breviter coalita, triangularia acuta 0.75 mm. longa et lata, dorso sparse pilosa, eglandulosa, ciliolata. *Petala*

punicea (ex *Kerr*) late ovata, acuta, circa 3 mm. longa et lata, eglandulosa. *Stamina* 2.5 mm. longa, antheris acutis eglandulosis. *Ovarium* ovoideum 1 mm. diametro; stylus circa 4 mm. longus. *Bacca* globosa, circa 5 mm. diametro.

Nakawn Sritamarat, Ban Natawn, c. 50 m., evergreen forest, *Kerr* 15644. Pattani, Kao Kalakiri, c. 400 m., evergreen forest, *Kerr* 15016 (*type*).

***Ardisia fimbriata* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. odontophyllae* Wall. affinis sed foliis glabris oblongis angustioribus basi attenuatioribus, sepalis vel rotundatis non acutis differt.

Frutex ad 2 m. altus (ex *Kerr*); ramuli saepe crassi, obtuse quadrangulares vel teretes, primo sparse puberuli mox glabri, brunnei vel griseo-brunnei, lenticellis paucis conspicue elevatis praediti. *Folia* oblongo-elliptica, apice attenuata, acuta, basi cuneata, 10–25 cm. longa, 3–8 cm. lata, chartacea, supra olivaceo-viridia brunneo-tincta, subtus pallidiora, griseo-brunnea, utrinque glabra, costa supra subconspicua subtus valde prominente, nervis lateralibus 20–30-paribus supra conspicuis subtus prominulis parallelis intra marginem arcuatim junctis, margine fimbriato-denticulata, petiolo 1.5–3 cm. longo supra manifeste canaliculato glabro suffulta. *Inflorescentiae* axillares nunc e bracteis parvis nunc e foliorum normalium axillis provenientes, nunc simplices corymbiformes nunc pauperrime paniculatae ex corymbis compositae, nutantes, circa 10 cm. longae, pedicellis gracilibus apicem versus paullo incrassatis 5–8 mm. longis. *Calycis* lobi ovati vel subrotundati, 1 mm. longi, 0.75 mm. lati, glabri, glandulosi. *Corolla* immatura; lobi 4 mm. longi, 3 mm. lati, ovati, apice obtusi, glabri, punctis parvis brunneis praediti. *Stamina* 2.5 mm. longa, antheris obtusis dorso punctatis.

Kanburi, Kao Ri Yai, c. 1400 m., evergreen forest, *Kerr* 10374.

***Ardisia fulva* King et Gamble var. *ciliata* Fletcher** [Myrsinaceae—Eumyrsineae]; a typo petalis ciliatis dorso pubescentibus differt.

Satul, Kuan Po, c. 20 m., savannah, shrub c. 1.5 m., flowers pink, *Kerr* 13826.

***Ardisia Garrettii* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. solanaceae* Roxb. affinis sed foliis chartaceis oblongioribus, floribus minoribus, pedunculis pedicellisque gracilioribus differt.

Frutex circa 2 m. altus (ex *Garrett*); ramuli teretes vel obtuse quadrangulares, glabri, brunnei vel griseo-brunnei. *Folia* oblonga vel oblanceolata vel obovata, apice acuminata, obtusa vel subacuta, basi attenuata, 8–15 cm. longa, 2.5–5 cm. lata, chartacea, supra grisea vel griseo-brunnea, viridi-tincta, subtus pallidiora, utrinque glabra, lepidibus minutissimis peradpressis consita, glandulosa, costa leviter impressa subtus prominente, nervis lateralibus 10–12-paribus parallelis subtus prominulis intra marginem arcuatis, margine integra, petiolo 5–10 mm. longo canaliculato glabro suffulta. *Inflorescentia* axillaris, umbellata vel racemosa, 4–8-flora, glabra; pedunculi 4–5 cm. longi; pedicelli 1.5–2.5 cm. longi, graciles, apicem versus

incrassati, punctati. *Calycis* lobi late ovati, 3 mm. longi, 4 mm. lati, apice rotundati, dorso multipunctati glanduloso-ciliati. *Corollae* tubus 1.5 mm. longus; lobi ovati 7–8 mm. longi, 5–6 mm. lati, valde glandulosi. *Stamina* 6.5 mm. longa, antheris subsessilibus acutis dorso valde punctatis. *Ovarium* globosum 1.5 mm. diametro, glandulosum; stylus 7 mm. longus glandulosus.

Chiengmai, Me Kang, 1330 m., evergreen forest by stream, *Winit* 1321. Doi Suteh, c. 1650 m., thick evergreen forest, *Kerr* 3594. Doi Angka, Me Ka Pak drainage, c. 1590 m., *Garrett* 667 (*type*). Doi Chiengdao, c. 1800 m., common in evergreen forest, *Kerr* 6572. Raheng, Hui Um Pa, c. 600 m., evergreen forest, *Winit* 229.

***Ardisia impressa* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. undulato-dentatae* Fletcher affinis sed foliis maioribus, nervis lateralibus supra impressis subtus patentibus, margine altius undulato-dentata differt.

Frutex; ramuli obtuse quadrangulares vel teretes, primo sparse puberuli mox glabri, brunnei vel griseo-brunnei. *Folia* elliptica vel oblongo-elliptica vel leviter obovata, apice acuta vel obtusa, basi longius attenuata, 12–20 cm. longa, 3–7 cm. lata, coriacea, supra viridia, brunneo-tincta, nitida, subtus pallidiora, brunneo-viridia, rubro-glandulosa, utrinque glabra, nervis supra impressis, costa subtus prominente, nervis lateralibus numerosis prominulis parallelis patentibus intra marginem arcuatis, margine undulato-dentata basi integra leviter recurva, petiolo 1 cm. longo supra valde canaliculato leviter alato glabro suffulta. *Inflorescentia* lateralis, corymbosa vel umbellata, furfuraceo-puberula, pedunculo communi vix evoluto vel 15 mm. longo, pedunculis partialibus ad 15 mm. longis, pedicellis 8–15 mm. longis saepe pendulis. *Sepala* basi breviter coalita, deltoidea, 1.5 mm. longa et lata, extra dense furfuracea, minute ciliata, conspicue glandulosa. *Corolla* punicea (ex *Kerr*); tubus circa 1.75 mm. longus; lobi ovati, circa 3 mm. longi, apice rotundati, minute rubro-glandulosi. *Stamina* corollae subaequalia, antheris acutis 3 mm. longis. *Ovarium* globosum 1 mm. diametro. *Bacca* rubra circa 7 mm. diametro, sparse puberula vel glabra, glandulosa.

Lampun, Mè Li, c. 400 m., moist mixed forest, *Winit* 1538. Korat, Ban Ta Chang, *Put* 3504. Sriracha, *Mrs. D. J. Collins* 1040. Sriracha, Nawng Nam Kio, c. 150–250 m., *Mrs. D. J. Collins* 1271. Kanburi, Baw Rê, *Put* 216 (*type*).

A rather variable species from the point of view of the inflorescence in that the common and partial peduncles sometimes are very well developed and at other times wanting.

***Ardisia langsuanensis* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. lanceolatae* Roxb. affinis sed foliis ellipticis, inflorescentia glabra, sepalis minoribus differt; nec non *A. sumatranae* Miq. affinis sed pedicellis petiolisque longioribus, baccis maioribus differt.

Arbor parva circa 6 m. alta (ex *Kerr*); ramuli validi, teretes vel leviter complanati, glabri, cortice brunneo vel cinereo obtecti.

Folia elliptica vel oblongo-elliptica, apice acuta, basi cuneata, 18-22 cm. longa, 6-8 cm. lata, chartacea vel chartaceo-coriacea, supra brunnea, viridi-tincta, subtus pallidiora utrinque glabra, glandulosa, punctulis bene prominulis, costa supra leviter impressa subtus prominente, nervis lateralibus numerosis parallelis subtus prominulis intra marginem arcuatim junctis, margine integra parum recurva, petiolo circa 2 cm. longo supra canaliculato glabro suffulta. *Inflorescentia* terminalis, multiflora, glabra, ex umbellis racemiformiter dispositis constituta; pedunculi circa 3 mm. longi; pedicelli circa 1.5 cm. longi. *Sepala* in fructu basi breviter coalita, latissime ovata, apice rotundata, 2 mm. longa, 2 mm. lata, glabra, multipunctata, glanduloso-ciliata. *Corolla* non visa. *Bacca* subglobosa, circa 8 mm. diametro, glandulosa, glabra.

Langsuan, Kao Nom Sao, c. 500 m., evergreen forest, *Kerr* 12025.

***Ardisia lenticellata* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. virenti* Kurz affinis sed foliis anguste lanceolatis differt; nec non *A. crispae* A.DC. affinis sed calycis lobis oblongis nec ovatis vel ellipticis differt.

Frutex circa 2 m. altus (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, glabri, virides vel griseo-virides, lenticellis numerosis atris non elevatis praediti. *Folia* lanceolata, apice acuminata, obtusa vel subacuta, basi cuneata, 10-18 cm. longa, 2-4 cm. lata, chartacea, punctulis parvis prominulis conspersa, utrinque viridia glabraque, costa supra subconspicua vel subimpressa subtus prominente, nervis lateralibus numerosis parallelis supra conspicuis subtus prominulis, margine crispato-crenata, leviter recurva, petiolo 8-10 mm. longo valde canaliculato leviter alato glabro suffulta. *Inflorescentiae* multiflorae ex umbellis multifloris longe stipitatis compositae bipinnatim paniculatae glabrae; pedicelli graciles, circa 15 mm. longi. *Sepala* basi breviter coalita, oblonga vel ovato-oblonga, 2-5 mm. longa, 1-1.5 mm. lata, glabra, valde punctata. *Corolla* punicea (ex *Kerr*); tubus brevis; lobi ovato-oblongi, obtusi vel subacuti, 7-7.5 mm. longi, 5 mm. lati, sparse punctati, intra basi papilloso. *Antherae* acutae dorso atro-punctatae filamentis paullo super basin corollae breviter affixis. *Ovarium* ovoideum 1 mm. diametro punctatum; stylus 5 mm. longus.

Prachuap, Kao Luang, c. 800-1000 m., evergreen forest, *Kerr* 10812 (*type*), *Kerr* 10836. Ranawng, Kao Pawta Chongdong, c. 900 m., evergreen forest, *Kerr* 16784.

***Ardisia longipedicellata* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. crispae* A.DC. affinis sed pedicellis longioribus differt; nec non *A. maculosae* Mez affinis sed inflorescentia glabra haud puberula differt.

Frutex circa 0.5 m. altus (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, glabri, grisei vel griseo-brunnei. *Folia* elliptica vel oblongo-elliptica, apice acuminata, subacuta vel obtusa, basi cuneata, 8-15 cm. longa, 2.5-4 cm. lata, chartacea, supra olivaceo-

viridia, subtus pallidiora, utrinque glabra, sparse punctata, costa supra subconspicua vel leviter impressa, subtus prominente, nervis lateralibus 8–10-paribus utrinque prominulis parallelis intra marginem arcuatim junctis, margine levissime grosse crenata, recurvata, petiolo circa 5–10 mm. longo supra canaliculato glabro suffulta. *Inflorescentia* terminalis, multiflora, simplicissime corymbosa, glabra; pedicelli ad 3 cm. longi, crassi; bracteae mox deciduae. *Calycis* lobi basi breviter coaliti, oblongi, in fructu 3–3.5 mm. longi, 1.5 mm. lati, eglandulosi, glabri. *Bacca* rubra (ex *Kerr*) globosa circa 5–7 mm. diametro.

Nawngkai, Chaiburi, c. 200 m., evergreen forest, *Kerr* 8523.

This species is quite distinct from *Kerr* 8523A—*A. stipitata* Fletcher, which has deltoid glandular not oblong eglandular calyx segments, more glandular and thinner leaves and the intramarginal nerve farther in from the margin.

***Ardisia multipunctata* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. fulvae* Ridl. affinis sed inflorescentia pauciflora, sparse nec valde puberula, antheris subsessilibus, nervulis prominulioribus differt.

Arbor parva circa 5 m. alta (ex *Kerr*); ramuli teretes, primo sparse pilosi mox glabri, brunnei vel griseo-brunnei. *Folia* elliptica vel leviter oblongo-elliptica, apice acuminata, acuta, basi attenuata, 6–12 cm. longa, 2.5–4 cm. lata, chartacea vel subcoriacea, supra viridia vel viridi-brunnea, subtus brunnea vel griseo-brunnea, utrinque glabra, lepidibus minutissimis peradpressis consita, glandulosa, costa supra leviter impressa, subtus prominente, nervis lateralibus numerosis parallelis utrinque prominulis, margine integra, petiolo 1–1.5 cm. longo supra canaliculato puberulo vel glabro suffulta. *Inflorescentia* lateralis, fere biflora, sparse puberula; pedunculi 1–2 cm. longi; pedicelli 1.5–2 cm. longi, apicem versus incrassati. *Sepala* basi manifeste coalita, late ovata vel rotundata, 1.5 mm. longa, 2 mm. lata, dorso puberula, multipunctata, valde ciliata. *Petala* punicea (ex *Kerr*) ovata, 6 mm. longa, 4.5 mm. lata, apice obtusa vel rotundata, valde glandulosa. *Stamina* 4.5 mm. longa, antheris subsessilibus acutis dorso punctatis. *Ovarium* globosum 2 mm. diametro; stylus 4.5 mm. longus.

Kao Kalakiri, c. 800 m., evergreen forest, *Kerr* 14986.

***Ardisia Murtonii* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. porosae* C. B. Clarke affinis sed inflorescentia puberula, calycis lobis obtusis vel rotundatis glandulosis, nec acutis et paene eglandulosis differt; nec non *A. rigidae* Kurz affinis sed pedicellis longioribus differt.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli quadrangulares, glabri, griseo-brunnei. *Folia* elliptica vel oblongo-elliptica, apice obtusa, basi cuneata vel subrotundata, 15–20 cm. longa, 5–7 cm. lata, coriacea, supra brunnea vel griseo-brunnea, subtus pallidiora, utrinque glabra, costa supra subconspicua subtus prominente, nervis lateralibus 12–14-paribus supra leviter impressis subtus prominulis parallelis, intra marginem arcuatim junctis, margine

integra, petiolo ad 5 mm. longo leviter alato glabro suffulta. *Inflorescentia* terminalis ad 25 cm. longa, paniculata, multiflora, puberula; pedicelli 5–10 mm. longi. *Sepala* basi breviter coalita, ovata, 2 mm. longa, 2 mm. lata, apice obtusa vel rotundata, dorso sparse puberula, conspicue punctata, ciliolata. *Corolla* purpurea (ex *Kerr*); lobi ovato-lanceolati, 7 mm. longi, 2.5–3 mm. lati, apice obtusi, glandulosi. *Stamina* petalis subaequalia antheris 5 mm. longis lanceolatis acutis dorso punctatis. *Ovarium* globosum circa 1.5 mm. diametro; stylus 7 mm. longus.

Kaw Chang, Klawng Nonsi, c. 10 m., evergreen scrub, *Kerr* 9195 (*type*). *Dr. Eryl Smith* 282. *Murton* 11. Chantabun, Klung c. 50 m., evergreen forest, *Kerr* 10020.

Murton 11 is quoted by Mez [Engler Pflanzenr., Myrsinaceae 139 (1902)], along with the type, *Helper* 3563 from Tenasserim, under *A. rigida* Kurz. The two collections are quite distinct. *Helper* 3563 has pedicels which are never more than 2.5 mm. in length—the length given by Mez in his description of *A. rigida*. The Kaw Chang plant has pedicels 10 mm. or sometimes more, in length.

***Ardisia nervosa* Fletcher** [Myrsinaceae—Eumyrsineae]; ab affini *A. Kerrii* Craib, foliis ellipticis vel leviter obovatis nec oblanceolatis nec obovato-oblanceolatis, apice obtusis nec abrupte acuminatis, floribus parum maioribus differt.

Arbor circa 8 m. alta (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, primo ferrugineo-puberuli mox glabri, cortice cinereo obtecti. *Folia* elliptica vel leviter obovata, apice late obtusa, basi cuneata, 7–14 cm. longa, 2–4.5 cm. lata, chartacea vel subcoriacea, supra griseo-brunnea, subtus pallidiora, utrinque glabra, subtus lepidibus minutis ferrugineis instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque numerosis parallelis supra conspicuis subtus prominulis, margine integra vel leviter crenata, petiolo circa 5 mm. longo canaliculato glabro suffulta. *Inflorescentia* submultiflora, e corymbis pinnatim dispositis constituta, foliis brevior; pedicelli graciles 4–7 mm. longi, sparse puberuli vel glabri. *Calycis* lobi deltoidei vel ovati, obtusi, 0.75–1 mm. longi, 1 mm. lati, valde ciliolati. *Corollae* tubus 0.75 mm. longus; lobi ovati, subacuti, 3 mm. longi, 2–5 mm. lati, glabri, eglandulosi. *Stamina* corollae subaequalia, antheris acuminatis. *Stylus* ante anthesin exsertus tandem porrectus, 5 mm. longus. *Ovarium* ovoideum 1 mm. diametro. *Bacca* 5 mm. diametro.

Chiengdao, Mûang Hêng, c. 700 m., evergreen forest by stream, *Kerr* 5515 (*type*). Mûang Chêm, Doi Ngao, c. 300 m., evergreen forest, *Kerr* 5440. Kanburi, Baw Rê, *Put* 225.

***Ardisia pedunculata* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. undulato-dentatae* Fletcher affinis sed pedunculis longioribus, calycis lobis maioribus differt.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, minute puberuli, brunnei. *Folia* elliptica vel

leviter obovata, apice acuminata, acuta, basi cuneata vel cuneato-rotundata, 8–16 cm. longa, 2.5–5 cm. lata, chartacea, utrinque brunnea nitida, glabra, sparse flavo-glandulosa, costa supra conspicua vel leviter impressa subtus prominente, nervis lateralibus 10–12-paribus supra subconspicuis subtus prominulis parallelis intra marginem arcuatim junctis, margine undulato-dentata, basi integra, leviter recurva, petiolo circa 5 mm. longo supra canaliculato puberulo vel glabro suffulta. *Inflorescentia* lateralis, simplicissime corymbosa, pedunculo circa 6 cm. longo furfuraceo-puberulo apice 1-foliolato, pedicellis 15–20 mm. longis puberulis gracilibus. *Calycis* lobi ovati vel ovato-oblongi, 3.5–4 mm. longi, 2 mm. lati leviter acuminati, acuti, extra*puberuli, fimbriolati, glandulosi. *Corollae* lobi basi breviter connati, ovati, 7–8 mm. longi, 3–3.5 mm. lati, apice acuminati, acuti, valde punctati. *Stamina* petalis breviora, antheris 5 mm. longis sagittatis acutis dorso punctatis, filamentis brevibus. *Ovarium* ovoideum, glandulosum 1 mm. diametro; stylus 5 mm. longus.

Surat, Ban Kawp Kêp, c. 50 m., evergreen forest, *Kerr* 13403.

***Ardisia penduliflora* Pitard var. *microsepala* Fletcher** [Myrsinaceae—Eumyrsineae] a typo sepalis minoribus pedicellis maioribus differt.

Ranawng, Kaw Bangben, c. 50 m., evergreen forest, *Kerr* 16655.

***Ardisia pilosa* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. villosae* Roxb. affinis sed foliis minoribus coriaceis paene glabris, sepalis minoribus ovatis glabris vel subpilosis nec oblongis pilosis differt.

Frutex parvus circa 0.5 m. altus (ex *Kerr*); ramuli quadrangulares vel paene teretes, primo pilosi mox glabrescentes, brunnei. *Folia* elliptica, 2.5–7 cm. longa, 1–3 cm. lata, apice obtusa, basi cuneata vel cuneato-rotundata, subcoriacea, griseo-brunnea, manifestius punctata, supra glabra, subtus primo subpilosa mox glabrescentia (costa excepta) costa supra subconspicua subtus prominente, nervis lateralibus utrinque numerosis parallelis obscuris, margine grosse crenata leviter recurva, petiolo 3–5 mm. longo supra canaliculato piloso suffulta. *Inflorescentia* longe stipitata, basi foliis binis plerumque instructa, submultiflora, umbellata, ferrugineo-pilosa; pedicelli curvati, crassiusculi, 12–15 mm. longi; bracteae lanceolatae vel oblanceolatae, 2–5 mm. longae. *Calycis* lobi ovati vel ovato-deltoides, 2 mm. longi, 1.5 mm. lati, basi subpilosi ceterum glabri, paucipunctati. *Petala* punicea (ex *Kerr*) basi breviter connata, lobis ovatis 7 mm. longis 4 mm. latis glabris multipunctatis. *Stamina* petalis breviora antheris obtusis dorso punctatis, filamentis brevissime affixis. *Ovarium* 1.5 mm. diametro, glabrum; stylus 7 mm. longus. *Bacca* rubra (ex *Kerr*) globosa, 7 mm. diametro, paucipunctata.

Lôi, Kao Krading, c. 1200 m., open grassy ground, *Kerr* 20111.

***Ardisia puberula* Fletcher** [Myrsinaceae—Eumyrsineae]; ab affini *A. Kerrii* Craib foliis lanceolatis, pedicellis brevioribus sepalis petalisque glandulosis differt.

Arbor circa 5 m. alta (ex *Kerr*); ramuli teretes, primo ferrugineo-puberuli, mox glabrescentes, cortice cinereo obtecti. *Folia* lanceolata vel oblongo-elliptica, apice obtusa, basi cuneata, 8–12 cm. longa, circa 2 cm. lata, chartacea, supra griseo-brunnea, subtus brunnea, utrinque glabra, subtus lepidibus minutis ferrugineis instructa, costa supra impressa subtus prominente, nervis lateralibus numerosis parallelis supra saepe obscuris subtus prominulis, margine integra, petiolo circa 5–10 mm. longo supra canaliculato glabro suffulta. *Inflorescentia* submultiflora, e corymbis pinnatim dispositis constituta, foliis brevior, furfuraceo-puberula; pedunculi 2–3 mm. longi; pedicelli 1.5–2 mm. longi. *Calycis* lobi deltoidei vel ovati, apice obtusi, 1 mm. longi, 1 mm. lati, glandulosi, ciliolati. *Corollae* tubus 0.75 mm. longus; lobi ovati, 3 mm. longi, 2.5 mm. lati, apice acuti vel subacuti, rubro-glandulosi, glabri. *Stamina* 2 mm. longa, antheris acutis dorso-punctatis. *Ovarium* ovoideum 1 mm. diametro; stylus ante anthesin exsertus tandem porrectus, 4 mm. longus.

Pattani, Bukit, c. 300 m., evergreen forest, *Kerr* 7099 (*type*). *Put* 3639.

***Ardisia punicea* Fletcher** [Myrsinaceae—Eumyrsineae]; ab affini *A. puberula* Fletcher inflorescentia maiore glabraque, petalis glandulisque paucioribus, foliis latioribus differt.

Frutex circa 3 m. altus (ex *Kerr*); ramuli obtuse quadrangulares, primo ferrugineo-puberuli mox glabri, cortice brunneo vel cinereo obtecti. *Folia* elliptica vel oblongo-elliptica, apice acuta vel subacuta, basi cuneata, 9–18 cm. longa, 2.5–4 cm. lata, chartacea, utrinque fusco-viridia glabraque, subtus lepidibus minutis ferrugineis instructa, costa supra impressa subtus prominente nervis lateralibus numerosis parallelis supra subconspicuis subtus prominulis, margine integra, petiolo circa 10 mm. longo supra canaliculato primo leviter puberulo mox glabro suffulta. *Inflorescentia* axillaris glabra, ex umbellis racemiformiter dispositis constituta, submultiflora, foliis brevior; pedunculi circa 8–15 mm. longi; pedicelli circa 5 mm. longi. *Calycis* lobi deltoidei, apice obtusi, 1 mm. longi, 1 mm. lati, valde glandulosi, ciliolati. *Corolla* punicea (ex *Kerr*), lobi ovati vel ovato-oblongi, apice rotundati, 3 mm. longi, 2 mm. lati, paucipunctati. *Stamina* corollae subaequalia, antheris 2 mm. longis acutis dorso paucipunctatis. *Ovarium* globosum 1 mm. diametro; stylus 5 mm. longus ante anthesin exsertus tandem porrectus.

Ranawng, Kao Pawta Luang Kêo, c. 1200 m., evergreen forest, *Kerr* 16944.

***Ardisia Rabilii* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. villosae* Roxb. affinis sed inflorescentia laterali differt.

Frutex (ex *Rabil*); ramuli quadrangulares, primo valde pilosi mox glabrescentes, brunnei. *Folia* elliptica vel oblongo-elliptica, apice acuminata, basi valde cuneata, circa 16 cm. longa, 5–7 cm.

lata, membranacea, utrinque brunnea, manifestius punctata, supra primo subpilosa mox glabra, subtus subpilosa, costa utrinque pilosa supra conspicua subtus prominente, nervis lateralibus 10–12-paribus utrinque subconspicuis parallelis, margine leviter crenata, petiolo 5–10 mm. longo supra canaliculato piloso suffulta. *Inflorescentia* lateralis, pauciflora, umbellata, valde pilosa; pedicelli crassiusculi circa 10 mm. longi; bracteae lanceolatae vel oblanceolatae, 2–5 mm. longae. *Calycis* lobi ovati vel ovato-oblongi, 7 mm. longi, 2.5–3 mm. lati, subacuti, pilosi, glanduloso-punctati. *Corolla* non visa. *Ovarium* globosum, pilosum.

Tungsong, Ban Pa Prêk, evergreen forest, *Rabil* 177.

***Ardisia rubro-glandulosa* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. cymosae* Blume affinis sed foliis lanceolatis, pedicellis longioribus, sepalis petalisque paene eglandulosis differt.

Frutex; ramuli teretes vel obtuse quadrangulares, primo ferrugineo-puberuli, mox glabrescentes, cortice cinereo obtecti. *Folia* lanceolata vel oblongo-lanceolata, apice acuminata, obtusa, basi cuneata, 8–16 cm. longa, 1.5–4 cm. lata, coriacea, rubro-glandulosa, supra brunnea vel griseo-brunnea, viridi-tincta, subtus pallidiora, supra glabra, subtus lepidibus minutissimis ferrugineis peradpressis consita, costa supra impressa subtus prominente, nervis lateralibus numerosis parallelis utrinque prominulis, margine integra vel leviter crenulata, recurva, petiolo 5–10 mm. longo supra canaliculato ferrugineo-puberulo suffulta. *Inflorescentiae* (immaturae), axillares, multiflorae, ex umbellis stipitatis bipinnatim paniculatae, furfuraceae; pedunculi 5 mm. longi; pedicelli 2 mm. longi. *Sepala* basi breviter coalita, lanceolata, acuta, 1 mm. longa, 0.5 mm. lata, dorso furfuracea, ciliata, sparse minute glandulosa. *Corolla* immatura, 2 mm. longa, paucipunctata vel eglandulosa.

Chiengmai, Doi Lang Ka, *Put* 3762.

***Ardisia siamensis* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. sanguinolentae* Wall. affinis sed sepalis rotundatioribus ciliatioribus, petalis puberulis, foliis ellipticis nec obovatis differt.

Frutex circa 1 m. altus (ex *Kerr*); ramuli obtuse quadrangulares primo sparse pilosi, mox glabri, brunnei, leviter rugosi. *Folia* elliptica vel leviter oblongo-elliptica, apice acuta, basi cuneata, 7–15 cm. longa, 2.5 cm. lata, chartacea, supra brunnea, subtus pallidiora, utrinque glabra, glandulosa, punctulis prominulis, costa supra impressa subtus prominente, nervis lateralibus numerosis parallelis intra marginem arcuatis supra obscuris vel leviter conspicuis subtus prominulis, margine integra vel leviter crenata, petiolo circa 1 cm. longo supra canaliculato glabro suffulta. *Inflorescentia* lateralis, multiflora, e corymbis pinnatim dispositis constituta, puberula, pedunculis circa 2.5 cm. longis, pedicellis ad 12 mm. longis. *Sepala* basi coalita, ovata, 2.5–3 mm. longa, 2.5 mm. lata, apice rotundata, dorso puberula, valde punctata, ciliata. *Corolla* purpurea (ex *Kerr*) 7 mm. longa; lobi 6 mm. longi, 4 mm. lati, dorso puberuli valde

punctati. *Stamina* 4.5 mm. longa, antheris subsessilibus acutis dorso punctatis. *Ovarium* globosum 2 mm. diametro; stylus 5 mm. longus. *Bacca* globosa, circa 5 mm. diametro, glabra, lepidibus minutissimis peradpressis consita.

Chiengkam, c. 450 m., *Kerr* 2464 (*type*). Chiengmai, Ban Djan, c. 350 m., *Hosseus* 367. Chiengmai, Me Kan, c. 750 m., *Winit* 49. Chiengmai, Me Awn, c. 450 m., scrub jungle, edge of paddy fields, *Kerr* 4695. Chiengmai, bought in market, *Mrs. D. J. Collins* 1236. Pre, c. 150–180 m., *Vanpruk* 149. Lampang, Mê Yom, c. 110 m., sandy bank of river, *Winit* 1601. Lampang, Muang Lawng, c. 160 m., evergreen forest, *Winit* 1893. Nawng Bua, c. 300 m., evergreen forest, *Kerr* 8618. Chaiyapum, Nawng Bua Deng, c. 300 m., evergreen by stream, *Kerr* 20305.

***Ardisia stipitata* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. longipedicellatae* Fletcher affinis sed sepalis deltoideis nec oblongis glandulosis nec eglandulosis differt.

Frutex circa 1 m. altus (ex *Kerr*), ramuli obtuse quadrangulares vel teretes, primo ferrugineo-puberuli mox glabri, grisei vel griseo-brunnei. *Folia* elliptica vel oblongo-elliptica vel oblongo-lanceolata, 6–16 cm. longa, 1–3 cm. lata, apice obtusa vel subacuta, basi cuneata, chartacea, griseo-brunnea, subtus parum pallidiora, utrinque glabra, costa supra subconspicua vel leviter impressa subtus valde prominente, nervis lateralibus numerosis parallelis utrinque prominulis 2 mm. intra marginem arcuatim junctis nervum intramarginalem distinctum formantibus, margine plus minusve crenulata vel paene integra, petiolo circa 3–7 mm. longo supra canaliculato ferrugineo-puberulo suffulta. *Inflorescentia* longe stipitata, basi foliis binis vulgo instructa, pauciflora, umbellata, in fructu ferrugineo-puberula; pedicelli crassiusculi, 10–15 mm. longi. *Calycis* lobi deltoidei, obtusi vel subacuti, 2 mm. longi et lati, extra puberuli, ciliolati, valde glandulosi. *Corolla* non visa. *Bacca* rubra, globosa, circa 6 mm. diametro, sparse puberula, glandulosa.

Nawngkai, Chaiyaburi, c. 200 m., evergreen forest, *Kerr* 8523A. TONKIN. Forêt de Than-Moi, *Balansa*, in Herb. Kew.

This plant is very distinct from the other members of the subgenus *Crispardisia* Mez, in having the continuous intra-marginal nerve as much as 2 mm. in from the margin and the marginal glands not in the crenations but opposite them on the marginal nerve. The Tonkin plant which I have seen, is quoted in *Flore Générale de l'Indo-Chine* iii. 857 under *A. chinensis* Benth. and is described as a *Crispardisia*. It bears no relationship to *A. chinensis* which has dentate or subdentate leaves and is therefore included in the subgenus *Bladhia* Mez.

***Ardisia subpilosa* Fletcher** [Myrsinaceae—Eumyrsineae]; *A. sanguinolentae* Wall. affinis sed floribus paucioribus, petalis eciliolatis, foliis ellipticis differt; nec non *A. multipunctatae* Fletcher affinis sed inflorescentia subpilosa nec sparse puberula, nervis lateralibus paucioribus differt.

Frutex circa 2 m. altus (ex *Kerr*) ; ramuli obtuse quadrangulares, primo pilosi mox glabri, cortice brunneo vel cinereo obtecti. *Folia* elliptica, apice acuminata, subacuta, basi cuneata vel subrotundata, 7–12 cm. longa, 3–6 cm. lata, chartacea, utrinque brunnea, glabra, lepidibus minutissimis peradpressis consita, glandulosa, costa supra leviter impressa subtus prominente, nervis lateralibus circa 8-paribus subtus prominulis parallelis intra marginem arcuatim junctis, margine integra vel leviter crenata, petiolo circa 5 mm. longo primo piloso mox glabro vel puberulo suffulta. *Inflorescentia* lateralis, 2–3-flora, subpilosa ; pedunculi circa 2 mm. longi ; pedicelli circa 1.5 cm. longi. *Calycis* lobi ovati, 3.5–4 mm. longi, 2.5–3 mm. lati, dorso puberuli, multipunctati, ciliolati. *Petala* punicea (ex *Kerr*) ovata, 7 mm. longa, 4–5 mm. lata, apice obtusa, multipunctata. *Stamina* 5–5.5 mm. longa, antheris subsessilibus acuminatis acutis dorso valde punctatis. *Ovarium* ovoideum, 2 mm. diametro ; stylus 6 mm. longus paucipunctatus.

Krabi, Tambon Kao Panom, c. 100 m., scrub, *Kerr* 18656.

***Ardisia translucida* Fletcher** [Myrsinaceae—Eumyrsineae] ; *A. maculosae* Mez affinis sed foliis glandulis numerosis pellucidis punctatis differt.

Frutex parvus circa 0.3 m. altus (ex *Kerr*) ; ramuli crassi, obtuse quadrangulares, primo sparse puberuli mox glabri, cinerei. *Folia* elliptica vel oblongo-elliptica, apice acuminata, acuta vel subacuta, basi cuneata, 15–20 cm. longa, 4–6 cm. lata, chartacea, glandulis numerosis translucidis munita, utrinque griseo-viridia glabraque, costa supra impressa subtus prominente, nervis lateralibus 12–14-paribus subtus prominentibus parallelis intra marginem arcuatis, margine leviter crenata, petiolo circa 1–2 cm. longo supra canaliculato primo puberulo mox glabro suffulta. *Inflorescentia* lateralis, pauciflora, umbellata, ferrugineo-puberula ; pedunculi 10 mm. longi ; pedicelli 8–10 mm. longi, crassi ; bracteae parvae, ovatae, circa 1 mm. longae. *Sepala* ovata vel deltoidea, basi breviter sed manifeste coalita, eglandulosa vel paucipunctata, 2 mm. longa, 1–1.5 mm. lata, apice rotundata, extra puberula, haud ciliata. *Petala* punicea (ex *Kerr*) basi breviter connata, ovata, apice subacuta, 6 mm. longa, 3–3.5 mm. lata, glabra, sparse punctata. *Stamina* corollae subaequalia, antheris acuminatis dorso paucipunctatis, filamentis brevissime sed manifeste affixis. *Ovarium* ovoideum 1 mm. diametro, glabrum ; stylus 4 mm. longus. *Bacca* rubra (ex *Kerr*) globosa, 1 cm. diametro.

Ranawng, Kao Pawta Luang Kêo, c. 200–600 m., evergreen forest, *Kerr* 16891.

***Ardisia undulato-dentata* Fletcher** [Myrsinaceae—Eumyrsineae] ; *A. japonicae* (Thunb). Blume affinis sed foliis undulato-dentatis antheris haud acuminatis differt ; nec non *A. chinensi* Benth. affinis sed petalis glandulosis differt.

Frutex parvus ; ramuli obtuse quadrangulares, primo manifeste ferrugineo-puberuli mox glabri, brunnei vel griseo-brunnei. *Folia*

elliptica, apice obtusa vel subacuta, basi cuneata, 5–10 cm. longa, 1.5–3 cm. lata, chartacea, supra viridia vel griseo-viridia, glabra, subtus brunnea vel griseo-brunnea, lepidibus parvis ferrugineis laxè consita, manifeste rubro-punctata, costa supra impressa subtus prominente, nervis lateralibus 10–12-paribus utrinque prominulis parallelis intra marginem arcuatim junctis, margine undulato-dentata, leviter recurva, petiolo 5–10 mm. longo supra canaliculato primo ferrugineo-puberulo mox glabro suffulta. *Inflorescentiae* axillares, ex umbellis 2–3 pauperrime paniculatae, minute furfuraceae pedunculo ad 5 mm. longo, pedicellis 5–8 mm. longis. *Calycis* lobi deltoidei, 1 mm. longi 0.75 mm. lati, extra furfuracei, ciliolati, rubro-glandulosi. *Corollae* tubus brevis; lobi ovati, attenuati, acuti, 2.5 mm. longi, 2 mm. lati, glabri, glandulis rubris praediti. *Stamina* petalis breviora 2 mm. longa, antheris acutis. *Ovarium* ovoideum 0.75 mm. diametro; stylus 4 mm. longus.

Langsuan, Tako, *Put.* 1631.

Chilocarpus cuneifolius *Kerr* (Apocynaceae-Carisseae); *C. costato* Miq. affinis, sed ramulis foliisque tenuioribus, floribus minoribus differt.

Frutex scandens, glaberrimus, inflorescentia minute puberula excepta, ramulis novellis leviter compressis, mox teretibus. *Folia* obovata vel oblanceolata, apice breviter obtuse acuminata, basi longe cuneata, ad 10.5 cm. longa, 4 cm. lata, chartacea, margine leviter revoluta, costa subtus prominente, supra subimpressa, nervis lateralibus utrinque 15–20, patulis, parallelis, cum nervo marginali conjunctis, subtus subprominentibus, supra minus conspicuis, nervulis intermediis e nervo marginali decurrentibus, pagina subtus minute punctata; petiolus c. 1 cm. longus, leviter rugosus, supra canaliculatus. *Inflorescentia* terminalis ad 6 cm. longa, omnino minute puberula, multiflora, floribus in ramulos ultimos subumbellatim confertis, ramis pedicellisque sulcatis, bracteis ovato-triangularibus c. 1.5 mm. longis haud imbricatis, pedicellis 1–2 mm. longis. *Alabaster* maturus c. 10 mm. longus. *Sepalae* ovatae, obtusae, margine cilatae, c. 1 mm. longae. *Corollae* tubus 5 mm. longus, subangulatus, medio leviter inflatus, intus infra staminum insertionem pilis deflexis indutus, fauce breviter puberulus; lobi falcati, 6 mm. longi, 2.5 mm. lati. *Stamina* subsessilia, antheris oblongis, basi obtusis, 1 mm. longis. *Ovarium* cum stylo 4 mm. longum, glabrum.

Nakawn Sritamarat, Prubua, c. 50 m., *Vanpruk* 705.

The type specimen described above consists of a single rather short shoot. A fruiting specimen from the Singapore Herbarium, *Haniff et Nur* 3931 from Krasom, which seems to be conspecific, has leaves up to 14 cm. long and 5.5 cm. broad, and an ovoid, somewhat pointed fruit, 5 cm. long and 3 cm. broad.

Melodinus crassipetalus *Kerr* (Apocynaceae-Carisseae); ab affini *M. cochinchinensi* (Lour.) Merrill floribus majoribus, corollae tubo intus dense villosa recedit.

Frutex scandens, ramulis novellis minute pubescentibus leviter compressis, mox teretibus, striatis. *Folia* oblonga vel ovato-oblonga, coriacea, apice obtusa, basi rotundata vel cuneata, margine leviter revoluta, sicco supra nigro-brunnea subtus pallidiora, costa basin versus supra subtusque minute pubescente, aliter glabra, costa subtus prominente supra impressa, nervis lateralibus utrinque 10–14, patulis, subtus prominentibus supra prominulis, rete nervorum subtus distincto supra obscuro, petiolo minute pubescente, rugoso, 5–6 mm. longo, suffulta. *Inflorescentia* cymosa terminalis, dense multiflora, minute pubescens, c. 5 cm. longa, 7 cm. lata, ramis sulcatis, bracteis ovatis, obtusis, 2 mm. longis, 2 mm. latis, pedicellis sulcatis, 4–6 mm. longis, bracteolis binis munitis. *Calyx* 5-partitus, pubescens, lobis tribus exterioribus late ovatis, obtusis, 3 mm. longis, 2.75 mm. latis, lobis interioribus oblongo-ovatis, 3 mm. longis, 1.9 mm. latis. *Corolla* alba, extus minute pubescens, tubo 7 mm. longo, basin versus leviter contracto, intus supra staminum insertionem dense villosa, deorsum pubescente, fauce squamis 5 parvis, bilobis vel bipartitis munito, lobis crassis, triangulari-ovatis, basi dextro auriculatis, c. 4 mm. longis. *Stamina* antheris c. 1.5 mm. longis, filamentis 0.5 mm. longis, supra medium tubi affixis. *Ovarium* cum stylo 4.5 mm. longum, glabrum. *Fructus* globosus, 4.5 cm. diametro, pericarpio lignoso. *Semina* ovoidea, c. 8 mm. longa, 5 mm. lata, testa ossea, cerebriformi.

Kaw Tao, c. 300 m., in evergreen forest, *Kerr* 12756.

***Rauwolfia membranifolia* Kerr** (Apocynaceae-Plumerieae); species *R. peguanae* Hook. f. atque *R. microcarpae* Hook. f. affinis, foliis tenuioribus fructu basi late rotundato differt.

Frutex c. 1 m. altus, glaber, ramulis primo leviter compressis laevigatis, mox teretibus leviter striatis lenticellis sparse instructis. *Folia* ternata, interdum opposita, elliptica vel obovata, apice abrupte acuteque acuminata, basi cuneata, 5–11 cm. longa, 2–4 cm. lata, tenuiter membranacea, sicco supra viridi-brunnea, subtus pallidiora, costa supra impressa subtus prominente, nervis lateralibus utrinque 8–12, supra inconspicuis, subtus prominulis, sensim angustatis, marginem versus evanidis; petiolus 2–4 mm. longus, basi glandulis vermiformibus praeditus. *Inflorescentia* axillaris, cymosa, pedunculata, 4–8-flora; pedunculus 6–12 mm. longus, glandulis minutis resiniferis obtectus; bractae lineares, acutae, c. 1 mm. longae; pedicelli c. 6 mm. longi. *Calyx* 5-partitus; lobi acute deltoidei, 1.5 mm. longi, margine basin versus 2–4 glandulis capitatis ornati; tubus c. 0.5 mm. longus. *Corolla* non visa. *Discus* tenuis annularis, leviter lobatus, c. 0.3 mm. altus. *Carpella* distincta, apice rotundata. *Drupa* oblique obpyriformis, basi late rotundata, endocarpio valde rugoso, c. 0.5 mm. alta.

Prachuap, c. 100 m., in dry evergreen forest, *Kerr* 21580

***Alyxia nitens* Kerr** (Apocynaceae-Plumerieae); *A. odoratae* Wall. et *A. Reinwardtii* Bl. affinis, ab illa fructu multo minore ab hac foliis nitidis fructus exocarpio pulposo differt.

Frutex scandens, inflorescentia excepta glaber. *Ramuli* hornotini subquadrangulares; ramuli annotini teretes, longitudinaliter rugosi, paucilenticellati, lenticellis prominulis. *Folia* ternata, elliptica, apice breviter obtuseque acuminata, basi cuneata, margine leviter revoluta, 6–7.5 cm. longa, 2.8–3.2 cm. lata, coriacea, sicco supra brunnea nitidissima, infra pallidiora opaca, costa valida, supra canaliculata, infra prominente, nervis lateralibus tenuibus utrinque 18–22, parallelis rectis patentibus, nervo marginali inconspicuo a margine 0.5 mm. distante conjunctis, supra inconspicuis, infra subprominulis; petiolus 5–6 mm. longus, supra alte canaliculatus, basi glandulis linearibus axillaribus minutis praeditus. *Cymae* axillares, breviter griseo-puberulae, 6–8-florae, 12–16 mm. longae, pedunculis 5–7 mm. longis inclusis, bracteis linearibus ad 2 mm. longis, pedicellis 1.5–2 mm. longis. *Calyx* 5-partitus, tubo perbrevis, lobis anguste ovatis 1.5 mm. longis. *Corollae* tubus 6–7 mm. longus, ad staminum insertionem leviter expansus, fauce contractus, intus infra staminum insertionem pilorum alborum zona praeditus; lobi c. 2 mm. longi. *Stamina* sub apice tubi inclusa, filamentis 0.5 mm. longis, antheris 1 mm. longis. *Discus* tenuis obscure lobatus, margine pilis albis dimidium carpellorum haud excedentibus praeditus. *Ovarium* c. 1 mm. altum; stylus 2 mm. longus; stigma obpyriformis. *Drupa* ovoidea, atro-purpurea, 8 mm. longa, 6 mm. diametro, exocarpio tenuiter pulposo, endocarpio cartilagineo, pedicello 3 mm. longo suffulta.

Trang, Silkao, near sea-level, climbing in scrub, *Kerr* 19005.

***Kopsia angustipetala* Kerr** (Apocynaceae-Plumerieae); species *K. jasminiflorae* Pitard affinis, sed floribus multo minoribus differt.

Frutex c. 5 m. altus; ramuli primo breviter cinereo-pubescentes, mox glabri, valde sulcati. *Folia* oblongo-lanceolata vel elliptica, apice longe acuminata basi cuneata, 4.5–12 cm. longa, 1.2–4 cm. lata, rigide chartacea glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 10–16, supra inconspicuis, subtus prominentibus fere ad marginem arcuatis, rete nervulorum subtus subconspicuo, margine integra recurva; petiolus 2–4 mm. longus, glaber canaliculatus, basi glandulis papillatis praeditus. *Inflorescentia* terminalis cymosa, cymis umbelliformiter confertis, pedunculata, pedunculo 0.5–7 cm. longo, cum bracteis calycibusque pubescente; bractee ovatae acuminatae subacutae usque ad 5.5 mm. longae, 2.5 mm. latae, sursum versus deminutae. *Calyx* 5-partitus; tubus perbrevis; lobi ovato-oblongi subacuti, 4 mm. longi, 1.5 mm. lati, extra intusque breviter pubescentes. *Corolla* hypocraterimorpha, alba; tubus 15 mm. longus, gracilis, apice inflatus, extra glaber intus infra insertionem staminum annulo pilorum alborum instructus, fauce villosus; lobi ovato-lineares, leviter falcati, acuti, 8 mm. longi, 1.5 mm. lati. *Stamina* in parte inflata tubi inserta; filamenta 3 mm. longa; antherae emucronatae, 1 mm. longae. *Disci* ligulae binae cum carpellis alternantes, c. 1.25 mm. longae. *Carpella* ovata, 0.75 mm.

alta, superne pilosa, 2-ovulata; stylus 11 mm. longus; stigma cylindraceum, 0.75 mm. altum. *Fructus* ignotus.

Nawngkai, Chaiyaburi, c. 200 m., *Kerr* 21325.

***Alstonia rupestris* Kerr** (Apocynaceae-Plumerieae); *A. neriifoliae* D. Don affinis, floribus multo minoribus corollae tubo pro rata brevior inter alia facile distinguenda.

Frutex omnino glaber, c. 4 m. altus; ramuli striati, lenticellis ovatis vel subrotundis copiose instructi. *Folia* 3-5-natim, saepius 4-natim, verticillata, sessilia, lanceolata, apice acuta vel acute subacuminata, basi sensim attenuata, interdum leviter auriculata, margine integra revoluta, 6-10 cm. longa, 1-1.7 cm. lata, coriacea, sicco supra nigro-brunnea, subtus pallidiora, nervis lateralibus rectis vel leviter arcuatis, crebre parallelis, cum nervo intramarginali subtus conspicuis, supra subconspicuis; glandulae axillares minutae subulatae. *Cymae* terminales verticillatim dispositae, pedunculatae, pedunculis 1.5-2.5 cm. longis; bractae triangulares c. 1 mm. longae. *Flores* apice pedunculorum umbellatim dispositi, pedicellati, pedicellis 3-5 mm. longis. *Calyx* glaber eglandulosus, lobis triangularibus, obtusis, 1 mm. longis. *Corollae* tubus 7 mm. longus, superne sensim dilatatus, extra glaber, intus infra staminum insertionem cinctu pilorum ornatus, fauce pilosus; lobi oblongi, in alabastro sinistrorsum obtegentes, apice rotundati, 3 mm. longi, 1.75 mm. lati. *Stamina* prope apicem tubi inclusa; antherae 1 mm. longae, apiculatae, filamentis 1 mm. longis suffultae. *Discus* anguste annularis, lobis ligulatis binis, carpellis alternis. *Ovarii* carpella distincta, 1 mm. alta, glabra; stylus 4 mm. longus; stigma subcylindraceum, apice apiculatum. *Fructus* folliculi bini, 5-7 cm. longi, sessiles, laeves, apice in rostrum c. 5 mm. longum attenuati. *Semina* oblonga compressa, c. 10 mm. longa, 2.5 mm. lata, margine leviter erosa praecipue basin versus, ciliata, ciliis brunneis apice basique elongatis.

Doi Chiengdao, c. 1800 m., on limestone rocks in open evergreen forest, *Kerr* 5560 (*type*), *Put* 366.

The description of the fruit and seeds has been drawn up from *Put* 366.

***Pagiantha peninsularis* Kerr** (Apocynaceae-Plumerieae); *P. corymbosae* (Roxb). Markgraf affinis, a qua floribus majoribus, inflorescentia pauciflora, inter alia, differt.

Arbor c. 12 m. alta, glaber, ramulis hornotinis compressis minute punctatis. *Folia* opposita, saepius imparia, oblongo-lanceolata vel lanceolata, apice longe obtuseque acuminata basi cuneata interdum leviter inaequilateralia, margine integra leviter recurva, 11.5-35 cm. longa, 3.8-11 cm. lata, subcoriacea, sicco supra viridi-brunnea, subtus pallidiora et minute lepidota, costa nervisque lateralibus subtus prominentibus, supra impressis, nervis lateralibus utrinque 10-14, subparallelis fere rectis, prope marginem sensim arcuatis mox evanidis, rete nervulorum obscuro, petiolo 1.3-3 cm. longo, supra canaliculato, ad axillam ligula brevi ornato, suffulta. *Inflorescentia* axillaris,

dichotoma, 3-7-flora, pedunculo communi perbrevis vel subnullo suffulta, pedunculis secundariis 1.3-3 cm. longis, bracteis minutis. *Calyx* 5-lobatus, 4.25 mm. altus, lobis obtusis margine ciliatis, coriaceis, 2.5 mm. longis, 2.5 mm. latis, intus glandulis obpyriformibus in quinque fasciculos e fundo tubi usque paulo supra basim loborum extendentes conglomeratis instructus. *Alabaster* loborum corollae rotundatus, lobis sinistrorsum obtegentibus. *Corolla* hypocrateriformis, alba, satis crassa; tubus 18 mm. longus, extra intusque glaber; lobi leviter sigmoidei, apice rotundati, basi margine obtegente leviter auriculati, margine obtecto basim versus bene undulato, 17 mm. longi, 5.5 mm. lati, supra minute pubescentes. *Stamina* prope faucem inserta; antherae 2 mm. longae, breviter mucronatae, thecis deorsum leviter divergentibus, theca externa basi paulo incurva, filamentis c. 2 mm. longis suffultae. *Discus* 0. *Carpella* distincta, 5 mm. alta, 2.5 mm. lata, apice rotundata, ovulis numerosis, 7-8-seriatis; stylus 10 mm. longus, infra glaber, sursum leviter incrassatus et minute pubescens; stigma subglobosum, stylo paulo crassius, apiculatum, apiculo papilloso. *Fructus* ignotus.

Ranawng, Kao Pawta Luang Keo, c. 500 m., evergreen forest, Kerr 16991.

This species is also represented by Parkinson 2052, collected on Victoria Island, South Tenasserim, some 50-60 kilometres north of the type locality.

Globba (Marantella) Garrettii Kerr (Zingiberaceae); *G. reflexae* Craib affinis, a qua foliis latioribus inflorescentia pilosiore distinguitur.

Herba erecta 1.2 m. alta (ex Garrett) caespitosa. *Folia* oblongo-lanceolata, apice caudato-acuminata, basi inaequaliter cuneata, interdum uno latere rotundata, 12-18 cm. longa, 4-5 cm. lata, brevissime petiolata, subtus molliter breviterque pubescentia, supra tenuiter pilosa; vaginae 6-7, ciliatae; ligulae brevissimae pilosae. *Inflorescentia* ad 9 cm. longa, basi genuflexa, ramis pilosis 8-15 inter se satis approximatis subpatulis; bractee virides reflexae ovato-oblongae vel obovato-oblongae, apice breviter acuminatae interdum fere rotundatae, infimae ad 17 mm. longae 6 mm. latae, superiores sensim minores; bulbilli minuti, obpyriformes, hirsuti c. 1.5 mm. longi. *Calyx* ut corolla staminodiaque glaber et minute glanduloso-punctatus, 4 mm. longus, breviter 3-lobatus, lobis majoribus duobus obtusis. *Corolla* lutea (ex Garrett); tubus 20 mm. longus; lobi 5 mm. longi. *Staminodia* lateraliter 7 mm. longa, elliptico-falcata obtusa. *Labellum* 13 mm. longum, bilobatum, lobis obtusiusculis c. 2 mm. longis. *Filamentum* 20 mm. longum; anthera 2.5 mm. longa, latere utroque alis duobus acutis interdum dente intermedio ornata, lobo superiore c. 3 mm. longo, 1 mm. lato, margine superiore unidentato, lobo inferiore parum minore. *Ovarium* parum verruculosum, 1.5 mm. altum.

Doi Chiengdao, c. 540 m., Garrett 983.

PLATE I

Kew Bulletin, 1937]



Dried material of *S. maritima* from Pen-y-fan, Brecknock Beacons, to show habit.

IV—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*:—XVII*. E. M. MARSDEN-JONES AND W. B. TURRILL.
GENETICAL INVESTIGATION OF A WELSH MOUNTAIN PLANT.

In July 1927 we received from C. V. B. Marquand a living plant of *Silene* collected on Pen-y-fan, one of the Brecknock Beacons, South Wales, at an altitude of 870 m. This plant being grown at Potterne remained constant to a peculiar tufted habit of growth and distinctive foliage characters. On the basis of its floral and fruit characters and its winter behaviour the plant had to be classified as *S. maritima*. Its coronal development was peculiar and the seeds were strongly tubercled. This plant was selfed and bred true to most of the distinctive characters. It segregated only for the following of all the characters investigated: corona, anthocyanin blotch, petal lobing, sex, filament colour, and stigmata colour.

The plant itself (A. 21) was crossed with *S. maritima* and *S. vulgaris* and the F_1 and F_2 families are analyzed in this paper and the results discussed. A description of the stock plant A. 21 is given below. Descriptions of the other stock plants will be found as follows: A. 1 in K.B. 1928, 4 and B. 11 in K.B. 1931, 121.

The following crosses and selfings are recorded.

- N. 46 = A. 21 selfed
- N. 47 = A. 2 \times A. 21
- N. 80 = N. 47 plant 2 selfed
- N. 49 = B. 11 \times A. 21
- N. 95 = N. 49 plant 18 selfed
- N. 96 = N. 49 plant 33 selfed
- N. 97 = N. 49 plant 25 selfed

A. 21. Brecknock Beacons, 15 July 1927, communicated by C. V. B. Marquand.

Habit: tufted very compactly, stems semi-prostrate up to 5 dm. long; little anthocyanin in vegetative parts; barren shoots persistent.

Indumentum: glabrous.

Leaves: narrowly oblanceolate to very narrowly elliptic, 5-6 cm. long, 1 cm. broad, ciliate, fleshy, green.

Inflorescence: of 3 to 4 flowers; flowers actinomorphic; bracts glabrous.

Calyx: much inflated, 2.0 cm. long, 1.2 cm. diameter in flower, enlarging considerably in fruit, with much anthocyanin.

Corolla: with the petals and segments not overlapping; diameter 2.7 cm. Petals 2.3 cm long, 1.2 cm. broad, lamina bilobed divided $\frac{2}{3}$ its length, no full scales but on different petals, even in the same flower, ranging from small scale to boss, with anthocyanin blotch.

Androecium: fully developed, flowers hermaphrodite. Filaments purple; anthers purple.

Gynoecium: with white stigmata and purple immature seeds.

* Continued from K.B. 1936, 459.

Ripe capsules : obloid, without the teeth 6 mm. long, 9 mm. broad, mouth 6 mm. in diameter ; teeth each an isosceles triangle, 4 mm. long, 2 mm. broad, strongly reflexed ; carpophore 3 mm. long, 2 mm. broad. The capsules are of an exaggerated *maritima* type.

Mature seeds : strongly tubercled.

N. 46 = A. 21 selfed. 63 plants in the family.

Habit : as immediate parents, stems up to 3 dm. long.

Indumentum : glabrous.

Leaves : as immediate parent.

Inflorescence : of 1 to 7 flowers ; flowers actinomorphic.

Calyx : as immediate parent.

Corolla : with petals and segments not overlapping, lamina divided $\frac{2}{3}$ its length ; 35 small scale : 17 boss : 6 small scale to boss ; 17 with anthocyanin blotch : 43 without anthocyanin blotch ; 9 multilobed : the remainder bilobed.

Androecium : 43 hermaphrodite only : 8 female only : 8 hermaphrodite and female. Filaments 42 purple : 9 white ; anthers all purple.

Gynoecium : 22 with white stigmata : 37 with purple stigmata ; all with purple immature seeds.

Ripe capsules : 36 (all that produced fruits) as immediate parent.

Mature seeds : 36 (all that produced seeds) strongly tubercled.

N. 47 = A. 2 \times A. 21. 52 plants in the family.

Habit : semi-prostrate and rather compact, with stems up to 5 dm. long ; medium amount of anthocyanin in stems, barren overwintering shoots present in all plants.

Indumentum : glabrous.

Leaves : oblanceolate to narrowly oblong, average of well developed leaves 3.7 cm. long, 0.8 cm. broad.

Inflorescence : of 3 to 7 flowers ; flowers actinomorphic.

Calyx : all broadly ellipsoid ; with much anthocyanin.

Corolla : with petals and segments contiguous or overlapping ; lamina lobed $\frac{3}{4}$ its length ; 38 small scale : 14 full scale ; 18 with anthocyanin blotch : 33 no anthocyanin blotch ; 4 multilobed : 48 bilobed.

Androecium : 27 with hermaphrodite flowers only : 7 with hermaphrodite and female flowers : 18 with female flowers only ; anthers all purple ; filaments 30 purple : 3 white.

Gynoecium : 27 with white stigmata : 25 with purple stigmata ; immature seeds all purple.

Ripe capsules : all of *maritima* type, 15 as A. 21 : 37 an open mouthed type.

Mature seeds : all tubercled.

N. 80 = N. 47 plant 2 selfed. 108 plants in the family.

N. 80 plant 2 had small scales, anthocyanin blotch, no multilobing, fully hermaphrodite flowers, purple filaments, purple stigmata, *maritima* (A. 21) capsule.

PLATE II

[*Kew Bulletin*, 1937

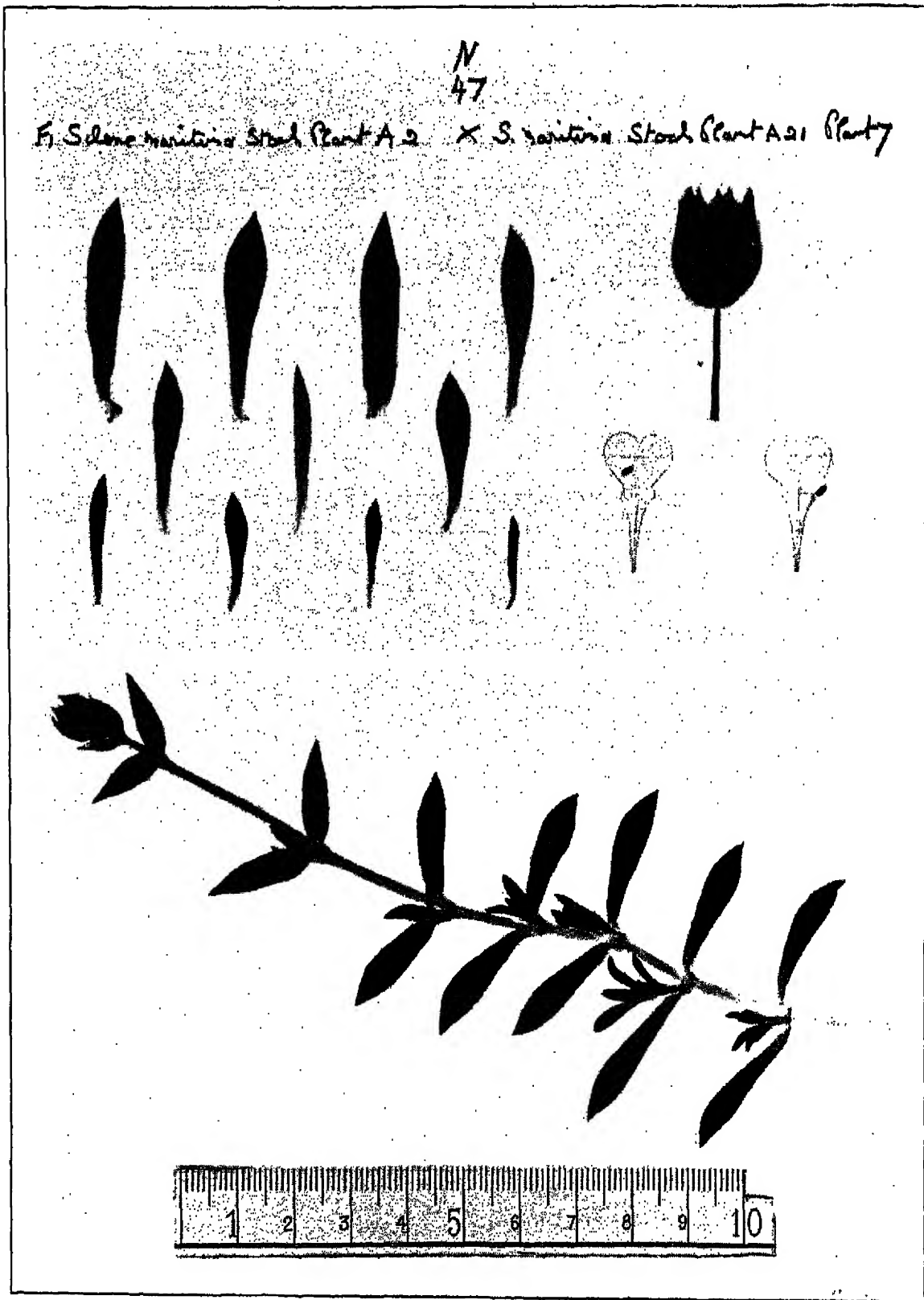


Specimens of *S. maritima* from Pen-y-fan, Brecknock Beacons, to show details of foliage and flower characters.

[To face page 46

PLATE III

Kew Bulletin, 1937]



Specimens of N.47 (A.2 x A.21) to show details of foliage and flower characters.
To face page 47]

Habit: 104 semi-prostrate and rather compact: 2 very compact and tufted as A. 21: 2 as A. 2; with stems up to 4.4 dm. long; medium anthocyanin in vegetative parts; barren overwintering shoots present in all plants.

Indumentum: glabrous.

Leaves: 2 plants segregated for A. 2 leaf type, 106 were intermediate between A. 2 and A. 21 types but with a bias towards A. 2; no A. 21 type appeared.

Inflorescence: of 1 to 3 flowers; flowers actinomorphic.

Calyx: 101 as A. 2: 7 as A. 21; all with much anthocyanin.

Corolla: 87 with petals overlapping or contiguous: 21 with petals not overlapping or contiguous; 59 with segments overlapping or contiguous: 49 with segments not overlapping or contiguous; 96 lamina lobed $\frac{3}{4}$ its length: 12 lamina lobed $\frac{2}{3}$ its length; 2 scale: 96 small scale: 2 boss: 2 small scale to scale: 6 small scale to boss; 79 with anthocyanin blotch: 29 no anthocyanin blotch; 7 multilobed: 101 bilobed.

Androecium: 63 with hermaphrodite flowers only: 22 with hermaphrodite and female flowers: 23 with female flowers only; anthers 85 purple; filaments 69 purple: 16 white.

Gynoecium: 95 white stigmata: 13 purple stigmata; immature seeds all purple.

Ripe capsules: all of *maritima* type and general shape, with reflexing teeth, no capsules approximating to *vulgaris* type appeared. 28 were scored as similar to A. 21 (a *super-maritima* in fruit characters) and 69 as similar to A. 2, but this scoring is of doubtful value since the differences are of small degree and fluctuations occur on the same plant. 11 were unscorable for ripe capsules.

Mature seeds: strongly tubercled 23: tubercled 51: armadillo 23: not scorable 11.

N. 49 = B. 11 \times A. 21. 23 plants in the family.

Habit: ascending more or less compact, with stems up to 6 dm. long, with a trace of anthocyanin, intermediate for barren stems.

Indumentum: medium for all plants.

Leaves: oblanceolate to linear-elliptic (average well formed), 3.6 cm. long, 1.2 cm. broad.

Inflorescence: of 7 to 12 flowers; slightly zygomorphic.

Calyx: inflated, with a medium amount of anthocyanin.

Corolla: with the petals and segments not overlapping; petals with lamina bilobed, $\frac{3}{4}$ lobed, all with bosses, with no anthocyanin blotch.

Androecium: 4 hermaphrodite and female: 29 female only. Filaments 4 purple; anthers 4 purple.

Gynoecium: 5 with white stigmata: 28 with purple stigmata; all with purple immature seeds.

Ripe capsules: all of F₁ type (K.B. 1928, p. 2, fig. 8).

Mature seeds: 5 strongly tubercled: 23 tubercled.

N. 95= N.49 plant 18 selfed. 32 plants in the family.

N.49 plant 18 was female and hermaphrodite with purple stigmata and tubercled seeds.

Habit: 8 spreading: 24 compact; 0 semi-prostrate: 32 ascending; stems from 1.5 dm. to 6.0 dm. long; 16 intermediate for barren stems: 16 barren stems absent.

Indumentum: 0 dense: 6 medium: 15 few: 11 glabrous.

Anthocyanin in vegetative parts: 8 much: 18 medium: 6 little.

Leaves: 0 M: 13 HM: 3 MH: 11 H: 2 VH: 3 HV: 0 V.

Inflorescence: of from 7 to 50 flowers.

Number of fls.	7	15	16	20	21	24	25	27	30	35	50
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Number of plants	3	13	2	3	3	2	1	2	1	1	1
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Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 22 medium anthocyanin: 9 little anthocyanin; 3 inflated: 25 subinflated: 4 as A.21.

Petals: all white; all bilobed; 17 lobed $\frac{3}{4}$: 13 lobed $\frac{2}{3}$: 1 lobed $\frac{1}{2}$; 1 blotch present: 30 blotch absent; petals 8 contiguous or overlapping: 23 not contiguous or overlapping; segments 1 overlapping: 30 not contiguous or overlapping; 2 plants small scales: 29 bosses.

Androecium: anthers 7 purple; filaments 6 purple: 1 white.

Sex: 4 with hermaphrodite flowers only: 4 with hermaphrodite and female flowers: 23 with female flowers only.

Gynoecium: 26 with purple stigmata: 5 with white stigmata; 27 immature seeds purple: 5 white.

Mature capsules: *maritima* (A.21) shape 6: *vulgaris* (B.11) shape 5: intermediate 15: unscorable 5; teeth reflexing 4: teeth spreading 22. All the capsules with teeth reflexing were of the *maritima* (A.21) shape, but one with *maritima* (A.21) shape had the teeth spreading.

Mature seeds: strongly tubercled 1: tubercled 25: unscorable 6.

N. 96= N.49 plant 33 selfed. 18 plants in the family.

N.49 plant 33 was hermaphrodite and female with purple stigmata and tubercled seeds.

Habit: 5 spreading: 13 compact; 2 semi-prostrate: 16 ascending; stems from 1.8 dm. to 5.6 dm. long; all intermediate for barren stems.

Indumentum: 4 medium: 6 few: 8 glabrous.

Anthocyanin in vegetative parts: 1 much: 17 medium.

Leaves: 2 M: 12 HM: 3 MH: 1 H.

Inflorescence: of from 7 to 27 flowers.

Number of flowers:	7	8	9	12	13	15	19	25	27
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Number of plants:	7	1	1	1	2	2	2	1	1
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Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 1 much anthocyanin: 15 medium anthocyanin: 2 little anthocyanin; 7 subinflated: 1 narrow: 10 as A.21.

Petals: all white; 11 bilobed: 7 multilobed; 9 lobed $\frac{3}{4}$: 9 lobed $\frac{2}{3}$; 2 blotch present: 16 blotch absent; petals 1 overlapping:

17 not overlapping or contiguous; segments all not overlapping or contiguous; 2 small scales: 16 bosses.

Androecium: anthers 7 purple; filaments 7 purple.

Sex: female flowers × hermaphrodite (on the same plant) gave 3 with hermaphrodite and female flowers: 4 with female flowers only. Hermaphrodite flowers selfed gave 4 with hermaphrodite flowers only: 7 with female flowers only.

Gynoecium: 13 with purple stigmata: 5 with white stigmata; 16 immature seeds purple: 2 white.

Mature capsules: *maritima* (A.21) shape 6: *vulgaris* (B.11) shape 2: intermediate 8: unscorable 5; teeth reflexing 6; teeth spreading 10. All the capsules with teeth reflexing were of the *maritima* (A.21) shape and all with *maritima* (A.21) shape had reflexing teeth; one of *vulgaris* shape had the teeth very slightly spreading.

Mature seeds: strongly tubercled 8: tubercled 8: unscorable 2.

N.97 = N.49 plant 25 selfed. 33 plants in the family.

N.49 plant 25 was female and hermaphrodite with purple stigmata and tubercled seeds.

Habit: 5 spreading: 28 compact; 4 semi-prostrate: 29 ascending stems from 1.2 dm. to 5.5 dm. long; all plants with very few green mostly lateral over-wintering barren shoots.

Indumentum: 8 dense: 7 medium: 5 few: 13 glabrous.

Anthocyanin in vegetative parts: 6 much: 26 medium: 1 little.

Leaves: 2 M: 15 HM: 3 MH: 13 H.

Inflorescence: of from 7 to 26 flowers.

Number of flowers: 7 15 18 19 20 23 26

Number of plants: 13 13 1 1 1 1 1

Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 26 medium anthocyanin: 4 little anthocyanin: 1 no anthocyanin; 2 inflated: 26 subinflated: 2 as A. 21: 1 narrow.

Petals: all white; all bilobed; 15 lobed $\frac{3}{4}$: 12 lobed $\frac{2}{3}$: 2 lobed $\frac{1}{2}$; none with anthocyanin blotch; 1 petals overlapping: 29 petals not contiguous or overlapping; 3 segments overlapping: 27 not contiguous or overlapping: all with bosses. Two plants had "poor petals".

Androecium: anthers 5 purple; filaments 4 purple: 1 white.

Sex: 4 with hermaphrodite flowers only: 1 with hermaphrodite and female flowers: 26 female flowers only.

Gynoecium: 26 with purple stigmata: 6 with white stigmata; 27 immature seeds purple: 3 immature seeds white.

Mature capsules: *maritima* (A.21) shape 6: *vulgaris* (B.11) shape 4: intermediate 6: unscorable 17; teeth reflexing 6: teeth spreading 8: teeth erect 2. One plant with *maritima* (A.21) capsule shape had the teeth spreading, the other 5 had the teeth reflexed; one plant with intermediate capsule shape had the teeth reflexing; two plants with *vulgaris* shaped capsules had the teeth erect, the other two had them very slightly spreading.

Mature seeds : strongly tubercled 3 : tubercled 10 : unscorable
20.

DISCUSSION

The characters investigated may be considered in sequence.

Habit: The F_1 between the mountain plant (A.21) and the A.2 *S. maritima* was approximately intermediate and the F_2 showed segregation, but with only two plants of A.2 type and two of A.21 type segregating, 104 being approximately as the F_1 plants. This is approximately what was expected since several factors are involved in giving the phenotypic expression termed habit. Anthocyanin was present in the vegetative parts in all the families and ranged from little to medium. The F_1 and F_2 , like the original parents, retained green over-wintering barren shoots.

The cross between the mountain plant and *S. vulgaris* gave an approximately intermediate F_1 , and segregated in F_2 in such a manner as to suggest that 3 factor pairs are involved in producing the habit. The summated figures for the F_2 families are—77 ascending: 65 compact: 18 spreading: 6 semi-prostrate. Little anthocyanin appeared in the vegetative parts of the parents and F_1 while the F_2 families segregated but showed most plants with a medium amount, in the ratio 15 much: 61 medium: 7 little. The F_1 plants showed an intermediate condition for retention of green overwintering barren stems and F_2 families showed little segregation for this character.

Maximum and minimum stem lengths are given for all families but stem length measurements were made for all plants only in the F_2 families from the interspecific cross. These are tabulated below and the results are chiefly of importance for comparison with other published and unpublished results—a comparison which is to be made in a later paper of this series.

Family	11-20	21-30	31-40	41-50	51-60	Maximum	Minimum	Mean	S.D. of mean
N.95	1	4	11	11	5	60	15	40	10.4
N.96	2	3	8	4	1	56	18	37	10.0
N.97	9	11	9	3	1	55	12	29	10.0
Totals	12	18	28	18	7	60	12	35	

Table of stem lengths, with a frequency table based on five classes with 10 cm. as the class range, and maximum, minimum, and mean in cm., and standard deviation of the mean for three F_2 families from three F_1 sibs.

Indumentum : N.47 and N.80 consisted only of glabrous plants from glabrous parents. The dense. \times glabrous gave a medium F_2

which segregated in the F_2 families in the summated ratio 8 dense : 17 medium : 26 few : 32 glabrous. This is low on the dense and high on the glabrous side for the expected 1 : 2 : 1 ratio (adding medium and few together).

Leaves : Both F_1 s gave approximately intermediate types. That involving A.2 segregated but gave only two plants of one (A.2) original parental type. That involving *S. vulgaris* segregated to give summated F_2 figures as follows :

4 M : 40 HM : 9 MH : 25 H : 2 VH : 3 HV : 0 V.

The value given to M here is that of the mountain plant (A.21), i.e. M has not the same value as in previous papers.

Inflorescence : N.47 and N.80 had the low numbers of flowers (1 to 7) characteristic of *S. maritima*. N.49 had 7 to 12 flowers per inflorescence. The F_2 families from this segregated giving the following summated results :

Number of flowers:	7	8	9	12	13	15	16	18	19	20	21
Number of plants:	23	1	1	1	2	28	2	1	3	4	3

Number of flowers:	23	24	25	26	27	30	35	50
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Number of plants:	1	2	2	1	3	1	1	1
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In the *S. maritima* crosses the flowers were all actinomorphic. In the *S. vulgaris* \times A.21, F_1 and F_2 families, all flowers were zygomorphic even if only slightly so, and no actinomorphic flowers segregated.

Calyx : In the *S. maritima* crosses the F_1 had broadly ellipsoid calyces and F_2 showed a small amount of segregation with a 15 to 1 ratio. When *S. vulgaris* was used as the ovule parent the F_1 had inflated calyces and the F_2 families gave complicated segregations possibly due to combinations of 3 factor pairs. Anthocyanin in calyx gave, in the F_2 families from *S. vulgaris* \times A.21, a ratio of 79 with : 1 without, suggesting that 3 factors are involved in a cumulative manner.

Corolla : Overlapping of petals and of segments is dominant to not overlapping. The ratios in the cross involving two *S. maritima* plants probably indicate a 3 to 1 ratio for petals. In the cross between *S. vulgaris* and A.21 the occurrence of a few plants with contiguous petals or segments is probably to be explained by their being really not overlapping or contiguous genetically. None of them has both petals and segments contiguous or overlapping. The degree of zygomorphy apart from the size and spread of the petal lamina, modified the phenotypic expression.

$\frac{3}{4}$ lobing is dominant over $\frac{2}{4}$ lobing and all F_2 families show segregation with $\frac{3}{4}$ lobed plants the more numerous (except that one small F_2 family gave equal numbers).

Coronal development in F_2 families is obviously very different from one family to another according to its development in the original ovule parent. A.21 did not breed true. Crossed with *S. maritima* with a good scale it segregated 14 scale : 38 small scale

and one of the latter selfed gave 2 scale : 104 small scale : 2 boss. Crossed with *S. vulgaris* with a boss it gave an F_1 all with bosses and F_2 families whose summated ratios were 4 small scales : 78 bosses. These figures probably indicate the influence of maternal cytoplasm.

All the original stock-plants used had bilobed petals. Segregation occurred in one F_1 and two F_2 families, but with small numbers of multilobed plants.

A.21 was heterozygous for petal blotch. Crossed with A.2 (see K.B. 1933, 361) it segregated in F_1 (18 : 33) and in F_2 (79 : 29). Crossed with *S. vulgaris*, F_1 had no blotch and F_2 threw 3 with blotch against 79 without. From the data at present available we are not sure of the nature of the several factors involved.

None of the original parents was homozygous hermaphrodite or homozygous female. One F_1 and all the F_2 families gave hermaphrodite, mixed, and female plants. One F_1 family gave only mixed and female plants. The F_2 families summate as follows :

From N.47	63 ♂ : 22 ♂ and ♀ : 23 ♀
From N.49	12 ♂ : 8 ♂ and ♀ : 60 ♀

The *Silene vulgaris* (B.11) used as the ovule parent to produce N.49 has a predominating female influence both in F_1 and F_2 families (see also our *Silene* paper XVI).

All plants had purple anthers and those used bred true for this character. The large proportion of female plants which appeared in F_1 and F_2 families make the figures for the segregating character of filament colour very small in N.49 and the F_2 families derived from it. Probably 2 or 3 factor pairs are involved and these are at least partly cumulative in action.

A.21 was heterozygous for stigmata colour but bred true for immature seed colour. Crossed with *S. maritima* (A.2), the F_1 and F_2 families segregated for stigmata colour in ratios of 1 : 1 and 1 : 7 respectively but bred true to immature seed colour. A.21 crossed with *S. vulgaris* (B.11) segregated in the F_1 and all F_2 families for colour in stigmata and for F_2 families for colour in immature seeds. The ratios range from 3 : 1 to 9 : 1. For colour in both stigmata and immature seeds several factors are needed.

Mature capsules : In the three F_2 families derived from the interspecific cross the following results were obtained :

	<i>maritima</i> shape	intermediate	<i>vulgaris</i> shape
N.95	6	15	5
N.96	6	8	2
N.97	6	6	4
	—	—	—
	18	29	11

Unfortunately, both fruits and seeds set very badly, especially in N.97. The figures probably represent a 1 : 2 : 1 ratio and this is in agreement with our previous results. There is a high correlation between *maritima* shape and reflexed teeth, *vulgaris* shape and erect teeth, and intermediate shape and spreading teeth. Occasion-

PLATE IV

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Specimens of N.49 (B.11 X A.21) to show details of foliage and flower characters.

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ally, however, this real or apparent linkage breaks down. This matter is discussed with additional evidence in the next paper of this series.

Mature seeds. A.21 (mountain *maritima*) had strongly tubercled seeds and on selfing bred true to this character. Crossed with A.2 (sea-coast *maritima* with armadillo seeds) it gave a tubercled F_1 and segregated in F_2 in the ratio 23 strongly tubercled : 51 tubercled : 23 armadillo. When crossed with a tubercled *vulgaris*, 5 of the F_1 plants were strongly tubercled and 23 tubercled and the F_2 families from three F_1 sibs segregated as follows :

	Strongly tubercled	Tubercled	Armadillo
N.95	1	25	0
N.96	8	8	0
N.97	3	10	0
	—	—	—
Totals	12	43	0

It is clear from the results published in this and previous papers that armadillo is recessive to both tubercled and strongly tubercled. Armadillo crossed strongly tubercled (both in *maritima*) gave 1 : 2 : 1 ratio in F_2 . Of the 83 plants in the F_2 families from the cross tubercled *vulgaris* × strongly tubercled mountain *maritima*, 28 failed to produce mature seed. The majority of these were in N.97, in which family only 13 plants out of 33 produced scorable mature seeds. This sterility (whatever its cause) makes any interpretation of the above figures unsatisfactory. It is probable that the F_1 sibs are not genetically equivalent for testa characters and that “strongly tubercled” and “tubercled” plants differ in cumulative genes. The constitution of B.11 as shown by selfing and other crosses is very imperfectly known (see Kew Bull. 1934, 383 seq.).

SUMMARY

The results are given of selfing a mountain plant from Wales and of crossing it with typical *Silene maritima* and *S. vulgaris*. In the majority of its characters the Welsh plant agreed with the generally accepted diagnostic characters of *S. maritima*. In several aberrant characters (foliage, corona, and calyx) previous contamination with *S. vulgaris* was suggested. Alternatively, the aberrant characters might represent more ancient phenotypic combinations than now usually found in coastal populations of *S. maritima*.

Analyses are given of the following characters and organs and their genetical behaviour : habit, indumentum, leaves, inflorescence, calyx, corolla (overlapping of petals and segments, depth of lobing, degree of lobing, corona, petal blotch), sex, filaments, anthers, stigmata, immature seeds, fruits, and mature seeds.

The research on which this paper is based has been aided by a Royal Society Government Grant.

V—TROPICAL AFRICAN PLANTS: XV.*

J. HUTCHINSON AND J. M. DALZIEL.

EBENACEAE

Diospyros longicaudata Gürke ex Hutch. et J. M. Dalz. Fl. West Trop. Afr. 2, 4 (1931); species foliis longe caudato-acuminatis, calyce truncato distincta.

Ramuli teretes, glabri. *Folia* oblongo-elliptica, longe acuminata, basi breviter cuneata, 8–12 cm. longa, 3–3.5 cm. lata, acumine circiter 2 cm. longo, glabra, nervis lateralibus 3–4 infra prominentibus; petioli 5 mm. longi. *Flores* axillares, solitarii, sessiles. *Calyx* truncatus, coriaceus, glaber, sicco leviter corrugatus, 3 mm. longus. *Corolla* alabastro tantum visa, glabra, calyce duplo longior.

S. NIGERIA: Johann Albrechtshöhe, Staudt 943 (type). CAMEROONS: Bipinde, Zenker 3765.

Diospyros insculpta Hutch. et J. M. Dalz. op. cit. 4; species foliis late ellipticis nervis lateralibus 5-jugis supra impressis distincta.

Ramuli sicco purpurascentes, glabri. *Folia* late elliptica, basi late obtusa, apice breviter et latissime acuminata, 12–16 cm. longa, 6–7 cm. lata, glabra, nervis lateralibus utrinsecus 5–6 supra insculptis infra valde prominentibus inter nervos laxè reticulatis; petioli circiter 7 cm. longi, transverse rugosi. *Flores* axillares, glomerati, subsessiles, sicco tantum visi, ovoidei. *Calyx* truncatus, 2.5 mm. longus, glaber. *Corolla* alabastro late ovoidea, subacuta, calyce duplo longior.

S. NIGERIA: Oban, Talbot 1609 (type).

Diospyros liberiensis A. Chev.† Expl. Bot. Afr. Occid. Franç. 396 (1920), nomen; ex Hutch. et J. M. Dalz. op. cit. 4; affinis *D. Mannii* Hiern, sed foliis ovatis vel ovato-ellipticis infra minute puberulis differt.

Ramuli sericeo-tomentelli, leviter flexuosi. *Folia* ovata vel ovato-elliptica, basi late rotundata, apice acute triangulari-acuminata, 9–13 cm. longa, 5–7 cm. lata, supra glabra, infra minute puberula, nervis lateralibus pilis leviter longioribus utrinsecus circiter 6 supra vix prominulis infra prominentibus, nervis tertiariis paucis arcuatis infra prominulis; petioli sericeo-pilosi, circiter 6 mm. longi. *Flores* masculi axillares, glomerati, breviter pedicellati. *Calyx* profunde 4-lobatus, sericeo-tomentosus, lobis triangulari-subulatis 2.5 mm. longis. *Corolla* alabastro oblongo-ovoidea, subacuta, circiter 6 mm. longa, extra appresse tomentella, matura non visa.

IVORY COAST: Lower Cavally river; Prolo, Aug., Chevalier 19857 (type).

Diospyros Thomasii Hutch. et J. M. Dalz. op. cit. 6; species aspectu *D. Barteri* Hiern, sed ramulis non pilosis et foliis non cordatis facile distinguitur.

Arbor usque ad 16 m. alta; ramuli floriferi molliter tomentelli. *Folia* oblonga ad late ovato-elliptica, basi rotundata, apice sensim

* Continued from K.B. 1936, 489.

† The types of Chevalier's species are in the Paris Herbarium.

acutâ, ad 14 cm. longa et 7 cm. lata, valde discoloria, supra glabra, atra, infra glauco-papillosa et plerumque praecipue in nervis parce setulosa; nervi laterales utrinsecus 3-5, tertiariis conspicuis et parallelis; petioli molliter tomentelli. *Flores* albi, axillares, glomerato-cymulosi, ubique tomentelli; bracteae parvae; calycis lobi late ovati, acuti, circiter 2 mm. longi, utrinque hirsutiusculi; corolla urceolato-cylindrica, basi contracta 8 mm. longa, extra adpresse tomentosa, lobis late subulatis brevibus recurvatis; stamina 10, filamentis pubescentibus, antheris 4 mm. longis apice subulato-apiculatis. *Flores* ♀ non visi. *Fructus* late ovoideo-globosus, usque ad 4 cm. diametro, molliter tomentellus, stylo persistente brevi apiculatus, endocarpio crustaceo circiter 2 mm. crasso; calyx persistens; semina 1.5 cm. longa, carnosa.

SIERRA LEONE: Bumbuna, Oct., *N. W. Thomas* 3293 (type); Pujehun, Feb. (fr.) *N. W. Thomas* 8437; York Pass, Mar., *Lane-Poole* 433; without loc., *Lane-Poole* 109. LIBERIA: Dukwia River, Monrovia, *Cooper* 129; 261; 378; Gbanga, Sept., *Linder* 481; Péahtah, Oct., *Linder* 895.

Described as a tree up to 50 ft. (*Lane-Poole*); according to *Cooper* the native name in Liberia is *Gueyh-Vine*, the wood is used for spring traps and the ripe berries are used for food; wood also used for boat-oars, and liquor obtained from the bark is used in the treatment of diarrhoea.

Maba Cooperi *Hutch. et J. M. Dalz.* op. cit. 7; affinis *M. Mannii* Hiern, sed foliis plus minusve oblongis, subabrupte et longe acuminatis minoribus, floribus breviter pedicellatis differt.

Arbor usque ad 12 m. alta; ramuli nigrescentes, parce puberuli. *Folia* plus minusve oblonga vel oblongo-elliptica, subabrupte et longe acuminata, basi oblique et inaequaliter cuneata, usque ad 10 cm. longa et 4.5 cm. lata, glabra, sed infra leviter pustulata, sicco atro-viridia; nervi laterales utrinsecus 5-6, infra valde prominentes, intra marginem furcati et conjuncti; petioli 3 mm. longi, minute setulosi. *Flores* ♂ tantum visi, plerumque in ramis vetustioribus dense fasciculati sed etiam floribus paucis axillaribus et interdum solitariis; pedicelli 3-4 mm. longi, parce pubescentes. *Calyx* undulate lobatus, extra glaber, intus pubescens, 2 mm. longus. *Corollae* *tubus* urceolatus, 2-5 mm. longus, lobis 3 divaricatis ovato-ellipticis 3 mm. longis; stamina pubescentia.

LIBERIA: Dukwia River, Oct., *Cooper* 92 (type); 316; Péahtah, in high bush of original forest, Oct., *Linder* 1029; 1066.

Described as a moderately plentiful tree up to 40 ft., with a long slender bole but no buttresses; used for house poles. Vernacular names: *Drebah*; *Bluchu*. The leaves are boiled for a black dye.

SAPOTACEAE

Chrysophyllum sericeum *A. Chev. ex Hutch. et J. M. Dalz.* op. cit. 9; species imperfecte cognita, foliis basi cordatis fere panduratis valde distincta.

Ramulus foliiferus tantum visus, adpresse tomentosus, internodiis 3-4 cm. longis. *Folia* basi cordata, elongato-oblonga vel fere pandurata, abrupte caudato-acuminata, 11-15 cm. longa, 3-6 cm. lata, supra glabra costa media juniore excepta, infra dense cinnamomeo-sericea, margine undulata; nervi laterales utrinsecus 12-15, infra prominentes, a costa sub angulo lato abeuntes et prope margines conjuncti. *Flores* et *fructus* non visi.

IVORY COAST: Indénié, between Zaranou and Bébou, Dec., 1909, *Chevalier* 22627 (type). GOLD COAST: without locality, *Vigne* 2059.

Flowers and fruits of this very distinct species are much desired. It may be recognised at once amongst the African species by the deeply cordate-based leaves.

***Chrysophyllum glomeruliferum* Hutch. et J. M. Dalz. op. cit. 9.** *C. obovatum* Engl. Monogr. Sapot. 43 (1904), non G. Don. *Manilkara* ("Manilhora") *dahomeyensis* A. Chev. Expl. Bot. Afr. Occid. Franç. 394 (1920), non Pierre; species foliis obovatis ad oblongo-oblanco-latis infra cinereo-tomentellis, floribus glomeratis sessilibus valde distincta.

Ramuli graciles, internodiis elongatis, juniores adpresse strigillosi. *Folia* anguste obovata ad late oblongo-oblanco-lata, late acuminata et obtuse mucronata, basi angustata, 8-18 cm. longa, 3-6 cm. lata, supra pallida, glabra et nitidula, infra cinereo-tomentella et parce strigilloso-pubescentia; nervi laterales utrinsecus 15-20, patuli, infra prominuli, prope marginem conjuncti, nervis secundariis distinctis; petioli 1-1.5 cm. longi, leviter pubescentes. *Flores* in ramulis glomerulati, sessiles. *Sepala* ovata, crassa, 2.5 mm. longa, extra parce pubescentia. *Corolla* calyce paullo longior. *Antherae* basi sagittatae, crassae, 1.5 mm. longae. *Ovarium* hirsutum, stylo crasso adpresse pubescente.

SIERRA LEONE: Mt. Gonkwi, Feb., *Scott Elliot* 4867 (type). DAHOMEY: Zagnanado, Feb., *A. Chevalier* 23034; Savalou, May, *Chevalier* 23732. UGANDA: Toro, 1400 m., *M. T. Dawe* 460; 1004; Budongo, *Fyffe* 165; Busingiro, May, *Eggeling* 1216 (For. Herb. 1324). KENYA: Kakamega, May, 1800 m., *Dale* (For. Herb. 3124).

This is another striking example of the close affinity and sometimes identity of the ligneous vegetation of West Africa and Uganda.

***Chrysophyllum metallicum* Hutch. et J. M. Dalz. op. cit. 9;** affine *C. albido* G. Don, sed foliis infra metallico-nitidis, floribus subsessilibus differt.

Arbor 25 m. alta, trunco 0.75 m. diametro, ligno duro roseo-brunneo, succo lacteo; ramuli adpresse pubescentes. *Folia* oblanceolata, obtuse acuminata, ad basin attenuata, 8-15 cm. longa, 2.5-4.5 cm. lata, supra glabra et crebre reticulata, infra metallico-nitida, breviter pubescentia; nervi laterales utrinsecus 10-15, infra prominentes, a costa sub angulo 45° abeuntes, venis inter nervos plus minusve reticulatis; petioli 1-2 cm. longi, adpresse tomentelli. *Flores* axillares, subsessiles, subfasciculati.

GOLD COAST: S. Ashanti; Banka, 140 m., Sept., *C. Vigne* 1364 (type).

A medium-sized tree 80 feet high and 6 ft. girth, with small cream flowers in clusters on the branchlets; the wood is hard, pink-brown, with a white latex, and when fresh it sinks in water. Vernacular name: *Krankabe* (Ashanti).

Chrysophyllum giganteum *A. Chev. ex Hutch. et J. M. Dalz. op. cit.* 9. *C. obovatum* *A. Chev. Veg. Util.* 5, 237 (1909), non G. Don; species foliis infra adpresse sericeis, fructibus lignosis 4–5 cm. longis distincta.

Arbor 30 m. alta, trunco 0.5–0.7 m. diametro; ramuli dense foliati, sericeo-tomentosi. *Folia* elliptico-obovata, breviter et late acuminata, basi subcuneata, 12–20 cm. longa, 5–8 cm. lata, supra glabra, infra adpresse sericea; nervi laterales utrinsecus circiter 11, a costa sub angulo lato sensim curvati, prope marginem evanidi, nervis tertiariis obliquis obscuris; petioli 1 cm. longi, molliter tomentelli. *Flores* alabastro tantum visi, axillares, tomentosi. *Fructus* subglobosi, 4–5 cm. longi, lignosi, glabri, exocarpio fere 1 cm. crasso.

IVORY COAST: Capiékrou, Jan., *A. Chevalier* 16180. Morénou, near Akabélé Krou, fr. Dec., *A. Chevalier* 22512 (type). GOLD COAST: Offin River, W. Ashanti, waterside, *T. F. Chipp* 115.

Chrysophyllum perpulchrum *Mildbr. ex Hutch. et J. M. Dalz. op. cit.* 10. *C. sp.* *Holl. in Kew Bull. Add. Ser.* 9, 398; species foliis infra rufo-tomentosis valde distincta; affine *C. fulvo* S. Moore, sed foliis majoribus infra permanente rufo-tomentosis (nec demum cinereis) differt.

Arbor usque ad 32 m. alta; ramuli internodiis brevibus, angulati, rufo-tomentelli. *Folia* oblongo-elliptica, obtuse et breviter acuminata, 12–22 cm. longa, 6–8 cm. lata, supra mox glabra, infra rufo-tomentosa, nervis lateralibus utrinsecus 10–20 infra valde prominentibus; petioli 2–2.5 cm. longi, stellato-tomentelli. *Flores* axillares, dense glomerati, sessiles, rufo-tomentosi. *Sepala* inaequalia, ovata, 3–4 mm. longa, crassa, interiora marginibus tenuibus. *Corolla* subglobosa, 3 mm. longa, glabra. *Antherae* cordatae, acutae. *Ovarium* dense hirsutum, stylo brevi crasso.

GOLD COAST: Ntakem, W. Prov., Mar., *C. Vigne* 234; 1185. S. NIGERIA: Benin; *Hitchens*; *Thomson* 8; *Sankey*. CAMEROONS: Dengdeng, 750 m., Apr., *J. Mildbraed* 8882 (type). UGANDA: Budongo, tree 80–100 ft., *M. T. Dawe* 789; 987; July, *Brasnett* 131.

Vernacular names: *Ejar* or *Ajar* (Sefwi, Gold Coast); *Attabini* (Ashanti); *Ekduro* and *Osanko* (S. Nigeria).

Until named for our Flora, leaf-specimens of this striking tree had lain for many years in the herbarium unidentified, for it was collected by Dawe in Uganda as long ago as 1905. He remarked that it was one of the most striking trees of the Budongo Forest on account of its rufous leaves and its enormous height. Dawe himself

recognised its identity with unnamed West African specimens. Brasnett remarks that it is found scattered in the Budongo Forest in groups, a number of young trees growing around a parent. The bark is corrugated, the blaze being reddish brown with white sap exuding.

Pachystela argentea A. Chev. ex Hutch. et J. M. Dalz. op. cit. 10.

Ramuli robusti, glabri, apicem versus 1 cm. diametro. *Folia* conferta, pandurato-obovato-oblonga, abrupte acuminata, ad basin leviter cordatum attenuata, 15–25 cm. longa, 6–9 cm. lata, undulata, sicco supra pallide viridia, infra pallide brunnea, haud reticulata; nervi laterales utrinsecus circiter 15, e costa sub angulo 45° abeuntes, marginem versus evanidi; stipulae subpersistentes, longe subulatae, 2–5 cm. longae. *Flores* et *fructus* non visi.

DAHOMEY: Bokotou Forest Reserve, near Sakete, Porto-Novo Circle, A. Chevalier 22865 (type).

An imperfectly known species the status of which must remain doubtful until flowers and fruits are collected.

Pachystela micrantha Hutch. et J. M. Dalz. op. cit. 11. *Mimusops micrantha* A. Chev. Veg. Util. 5, 244 (1909); Explor. Bot. Afr. Occid. Franç. 393 (1920); affinis *P. brevipedis* Baill., foliis late et obtuse acuminatis minoribus, stipulis deciduis differt.

Arbor ad 30 m. alta; ramuli minute adpresse pubescentes, apice dense foliati. *Folia* oblongo-oblancheolata vel obovato-elliptica, obtusissime et late acuminata, basi acuta, 8–13 cm. longa, 2.5–4 cm. lata, glabra, nervis lateralibus numerosis obscuris; petioli 1 cm. longi, parce adpresse pubescentes vel mox glabri; stipulae deciduae. *Flores* in ramulis annotinis fasciculati, breviter pedicellati, virides; pedicelli puberuli. *Sepala* 5, late ovata vel suborbicularia, 1.5 mm. longa, subcoriacea, minutissime ciliolata. *Corollae* tubus 1 mm. longus, glaber; lobi elliptici, 2.5 mm. longi. *Stamina* 5, corolla paullo longiora; antherae 1.35 mm. longae. *Ovarium* dense hirsutum; stylus 2 mm. longus, basin versus leviter pubescens, stigmatate leviter incrassato.

SIERRA LEONE: Njala, tree 20 ft. high, flowering only for a few days, flowers green, May, F. C. Deighton 696; 2617; C. E. Lane-Poole 458. IVORY COAST: Anyama, Feb., A. Chevalier 16226 (type); Aboisso, Afr., A. Chevalier 16307; between Zaéblé and Boutoubré, May, A. Chevalier 17979. GOLD COAST: Abofaw, tree 35 ft., 3 ft. girth, wood hard, June, C. Vigne 1179. S. NIGERIA: Sapoba, J. D. Kennedy 1671.

According to Kennedy, For. Fl. S. Nigeria, 195 (1936), the Beni brass-workers obtain the best charcoal from the wood. The *Sokei* (Mende), *Kpengilopio* (Kisi) of Sierra Leone (Deighton).

Deighton states that the fruit is edible and has a pleasant taste.

Delpydora gracilis A. Chev. ex Hutch. et J. M. Dalz. op. cit. 11; a *D. macrophylla* Pierre foliis basi haud auriculatis facile distinguitur.

Frutex usque ad 1 m. altus; rami hispidi. *Folia* elongato-obovata, longe et acute acuminata, basi attenuata, usque ad 30 cm. longa et 9 cm. lata, infra in costa media pilosa; nervi laterales utrinsecus 18–20, patuli, nervis tertiariis tenuibus obliquis; petioli dense setosi. *Flores* axillares, fasciculati vel solitarii; pedicelli parce setulosi. *Sepala* extra laxe setosa, oblonga, 5 mm. longa. *Corolla* late tubulosa, glabra, 6 mm. longa, lobis ellipticis 3 mm. longis longitudinaliter nervosis. *Filamenta* libera, glabra; antherae circa stylum conniventes, 2 mm. longae. *Ovarium* dense setosum; stylus subulatus, 4 mm. longus, glaber. *Fructus* depresso-globosus, circiter 4 cm. diametro, dense setosus, exocarpio crustaceo. *Semina* oblonga, 2.5 cm. longa, testa carnosae.

LIBERIA: Dukwai River, Monrovia, fr. Oct.–Nov., Cooper 29; 46; 175. IVORY COAST: Cavally basin, A. Chevalier 19583 (type); 19672. GOLD COAST: near Prestia, Sept., C. Vigne 3083. Simpa, C. Vigne 1973.

Described by the collectors as a small shrub common in the undergrowth in evergreen forest; flowers yellow; fruits red and covered with bristles. The habit and appearance must be very similar to that of dwarf species of *Tetracera* (*Dilleniaceae*) such as I have collected in Northern Rhodesia.

***Sideroxylon altissimum* Hutch. et J. M. Dalz.** op. cit. 12. *Hormogyne altissima* A. Chev. Explor. Bot. Afr. Occid. Franç. 392 (1920), nomen subnudum; species foliis haud acuminatis ellipticis basi rotundatis glabris nervis lateralibus utrinsecus 12–15, pedicellis et calyce tomentellis distincta.

Arbor 35–40 m. alta, trunco cylindrico; ramuli puberuli. *Folia* elliptica, basi rotundata, apice emarginata, 5–10 cm. longa, 4–6 cm. lata, glabra, nervis lateralibus infra distinctis; petioli 1 cm. longi, parce puberuli. *Flores* axillares, fasciculati ad subsolitarii; pedicelli tomentelli, circiter 5 mm. longi. *Calyx* extra minute tomentellus, lobis oblongo-ellipticis 4.5 mm. longis. *Corolla* 5.5 mm. longa, tubo late cylindrico glabro, lobis rotundato-truncatis minutissime ciliolatis. *Stamina* medio corollae tubi inserta. *Ovarium* inferne dense hispidum; stylus 3 mm. longus, glaber, minute lobulatus. *Fructus* obovoideus, 1.5 cm. longus, exocarpio carnosus. *Semina* ovoidea, hilo lato elliptico fere aequilongo.

FRENCH GUINEA: various localities (Chev. l.c.), A. Chevalier 13129; 13141 (type); 13404; 13583; 20749. GOLD COAST: Abetifi, Kwahu, Mar., W. H. Johnson C24; Brent in Herb. Chipp 543; near Buzumtwi, big tree 120 ft. high, 8 ft. in girth, in closed forest, small yellow flower, wood white, Dec., Vigne 1498.

***Omphalocarpum pachysteloides* Mildbr. ex Hutch. et J. M. Dalz.** op. cit. 13; species floribus in ramulis defoliatis fasciculatis, foliis oblongo-oblancheolatis obtuse acuminatis distincta.

Arbor (?), ramulis adpresse tomentosis mox glabrescentibus. *Folia* oblongo-oblancheolata, late et obtuse acuminata, basi angustata,

12–30 cm. longa, 4–8 cm. lata, glabra, infra laxe reticulata, nervis lateralibus utrinsecus 8–10 intra marginem conjunctis; petioli usque ad 4 cm. longi, supra costati. *Flores* albi, in ramulis defoliatis fasciculati; pedicelli 5 mm. longi, adpresse tomentosi. *Calyx* tomentosus; segmenta ovata, apice rotundata, 8 mm. longa. *Corolla* brevis, profunde 5-lobata, lobis ovatis 3.5 mm. longis. *Stamina* circiter 15, fasciculis petalis opposita; staminodia inter petala, petaloidea, triangularia, acute acuminata. *Ovarium* tomentosum; stylus rigidus, glaber, 2.5 mm. longus.

SIERRA LEONE: Kabusa, Apr., *Scott Elliot* 5471. CAMEROONS: Kongola, 750–800 m., in galerie forest, Apr., *Mildbraed* 9021 (type); near Dengdeng, Mar., *Mildbraed* 8561; 8789.

Mimusops Heckelii *Hutch. et J. M. Dalz.* op. cit. 14; comb. nov. *Dumoria Heckelii* A. Chev. in *Compt. Rend. Acad. Sci. Par.* 145, 267 (1907). *Tieghemella Heckeliana* Pierre ex Dubard in *Ann. Mus. Col. Marseille*, Ser. 3. 3, 33, in obs. (1915).

MYRSINACEAE

Afrardisia oliganthe *Gilg et Schellenb.*, quoted by us (op. cit. 15) as of these authors in MS., was published with a description in *Engl. Bot. Jahrb.* 48, 517 (1912).

Embelia djalonensis *A. Chev. ex Hutch. et J. M. Dalz.* op. cit. 16. *E. guineënsis* Mez in *Engl. Pflanzenr.* 4, Heft 236, 331, non Baker; affinis *E. guineënsi* Baker, costa media foliorum infra lanata, nervis lateralibus conspicuis differt.

Scandens; rami teretes; ramuli laterales ultimi breves glabri. *Folia* obovato-elliptica, apice rotundata vel emarginata, basi late cuneata, 8–9 cm. longa, 4–5 cm. lata, utrinque nigro-punctata, costa infra usque ad supra medium lanata; nervi laterales numerosi, utrinque conspicui, a costa sub angulo 45° abeuntes, marginem versus laxe ramosi; petioli 1 cm. longi. *Racemi* brevissimi; pedicelli 2–3 mm. longi, parce puberuli. *Sepala* late triangularia, 0.75 mm. longa. *Petala* elliptica, 3 mm. longa, nigro-punctata. *Stamina* fere ad medium petalorum adnata; antherae 1.25 mm. longae, filamentis breviores. *Ovarium* glabrum; stylus bifidus. *Fructus* globosus, 6 mm. diametro, lineis interruptis longitudinaliter notatus.

FRENCH GUINEA: Kollangui, Mar., *A. Chevalier* 13537 (type); Dantilia (Niger), fr. Mar., *Scott Elliot* 5266.

Maesa nuda *Hutch. et J. M. Dalz.* op. cit. 16; affinis *M. lanceolatae* Forsk., sed foliis obovatis parte inferiori integris, inflorescentiis paucifloris et parce ramosis, floribus distincte pedicellatis differt.

Frutex ut videtur scandens; ramuli glabri. *Folia* obovata, parte inferiore integra, superiore obtuse dentata, basin versus leviter rotundata vel late cuneata, breviter acuminata, 10–12 cm. longa, 5–7 cm. lata, glabra; nervi laterales utrinsecus circiter 6, leviter ramosi; petioli 1.5–2 cm. longi. *Inflorescentia* basi

ramulo leviter adnata, parce ramosa, gracilis, usque ad 10 cm. longa; bracteae subulato-lanceolatae, 2 mm. longae; pedicelli bracteis paullo longiores; bracteolae 2, superiore calyce subtendente triangulari. *Calycis lobi* ovato-triangulares, acuti. *Petala* elliptica, parva. *Ovarium* glabrum.

FRENCH GUINEA: without locality, 1906, *Farmar* 327.

LOGANIACEAE

***Mostuea hymenocardioides* Hutch. et J. M. Dalz.** op. cit. 20; affinis *M. Thomsonii* Benth., sed foliis acute acuminatis ramulis junioribus utrinque lineis pilorum instructis, fructibus multo majoribus differt.

Frutex ramosissimus, gracilis, ad 1.75 m. altus; ramuli foliiferi brevissimi, pilorum lineis binis oppositis ornati. *Folia* ovata, late acuminata, basi latissime cuneata, 4-5 cm. longa, usque ad 3 cm. lata, nervorum axillis pilosis exceptis glabra, nervis lateralibus utrinsecus circiter 4-5. *Inflorescentiae* pauciflorae, ramulos terminantes; bracteae subulatae. *Calycis segmenta* linearia, 4.5 mm. longa, breviter ciliata. *Corolla* late tubuloso-turbinata, 1 cm. longa, glabra, lobis parvis. *Stamina* vix exserta; filamenta inaequilonga, apicem versus parce pubescentia. *Ovarium* ovoideum, glabrum; stylus 1.25 mm. longus, lobulatus. *Fructus* 1 cm. longus, late bilobatus, lobis obtusis ad rotundatis glabris conspicue nervosis.

FRENCH GUINEA: near Dantilia River, Mar., *Scott Elliot* 5268 (type); common on Niger bank at Farana, *Scott Elliot* 5038. SIERRA LEONE: Laminaiya, Apr., *N. W. Thomas* 123; 10013; 10248; near Tassin, Scarcies River, Jan., *Scott Elliot* 4515.

***Lachnopylis Mannii* Hutch. et M. B. Moss** in *Flora West Trop. Afr.* 2, 20 (1931). *Nuxia Mannii* Gilg in *Engl. Bot. Jahrb.* 32, 140 (1902).

FRENCH GUINEA: Futa Jallon, in the bush at Diaguissa, Dec., *O. Caille in Herb. Chevalier* 18011. IVORY COAST: Upper Sassandra, Mt. Boho, over 800 m., May, *A. Chevalier* 21494. CAMEROONS MT.: 2400 m., Jan., *G. Mann* 1206 (type); 2300 m., *G. Mann* 2184; Musaku Camp, 1500 m., *T. D. Maitland* 458; 996; Nyanga Camp, 2500 m., Dec., *T. D. Maitland* 1194; Onyanga, 2700 m., *M. Steele* 64A.

***Lachnopylis guineënsis* Hutch. et J. M. Dalz.** op. cit. 20; affinis *L. Mannii* Hutch. et M. B. Moss, sed foliis serratis usque subintegris ellipticis utrinque angustatis, calyce extra leviter puberulo differt.

Arbor usque ad 8 m. alta; rami erecti, glabri. *Folia* late oblanceolata ad rhomboideo-obovata, 4-6 cm. longa, 2-3.5 cm. lata, apicem versus leviter serrata, glabra; petioli 0.5-1 cm. longi. *Inflorescentia* terminalis, dense corymbosa; bracteae oblongae, pedicellis dimidio breviores. *Calyx* 6-7 mm. longus, extra breviter puberulus, intus adpresse pilosus, lobis triangularibus marginibus hyalinis. *Corollae tubus* cylindricus, 5 mm. longus, utrinque glaber; lobi oblongo-ovati, apice cucullati, intus basin versus et extra

ubique reflexo-setoso-pilosi. *Stamina* longe exserta. *Ovarium* dense pilosum ; stylus glaber.

SIERRA LEONE: Mt. Gonkwi, 1000 m., on rocks fringing the precipice, tree or shrub 20 ft. high., Feb., *Scott Elliot* 4824 (type). GOLD COAST: Bana Hill, Krobo, in deciduous forest, tree 20-25 ft., flowers white, Mar., *F. R. Irvine* 893.

Gaertnera Cooperi *Hutch. et M. B. Moss* in *Flora West Trop. Afr.* 2, 21 (1931). *G. paniculata* A. Chev. *Explor. Bot. Afr. Occid. Franç.* 444 (1920), partim, non Benth.; affinis *G. paniculatae* Benth., sed inflorescentia minore compacta, pedunculo puberulo, costa foliorum infra puberula (nec pilosa) differt.

Arbor parva usque ad 8 m. alta ; ramuli satis robusti, dense puberuli, demum glabrescentes. *Folia* elliptica, breviter acuminata, basi subrotundata, 15-25 cm. longa, 7-10 cm. lata, costa infra puberula excepta glabra ; nervi laterales utrinsecus 8-10, infra prominentes, tertiariis numerosis obliquis ; petioli 1-2 cm. longi, puberuli ; stipulae intrapetiolares, breves, mox deciduae. *Inflorescentia* terminalis, multiflora, corymbosa, compacta, circiter 6 cm. diametro, ubique puberula ; bracteae ovatae, subacutae, 3-4 mm. longae. *Calyx* undulatim lobatus, 3 mm. longus, rufescens. *Corolla* tubulosa, cylindrica, 1.5 cm. longa, extra minutissime puberula ; lobi oblongi, 8 mm. longi, apice inflexi, intus albo-villosi ; tubus infra apicem versus annulo pilorum alborum instructus. *Filamenta* 0.5 cm. longa, glabra ; antherae 3 mm. longae. *Stylus* brevis, profunde bilobatus, lobis crassis pubescentibus acutis. *Fructus* baccatus, globosus, primum cinereo-viridis demum caeruleus (sicco niger), circiter 1 cm. diametro.

FRENCH GUINEA: various localities (Chev. l.c.), *A. Chevalier* 12420 : 12664 ; 12936. LIBERIA: Dukwia River, *G. P. Cooper* 202 ; 287 (type) ; Cape Palmas, *G. P. Cooper* 465 ; Sinoe Basin, *A. Whyte* ; Du River, Aug., *D. H. Linder* 286 ; Monrovia, Nov. (fl. & fr.), *D. H. Linder* 1487A. GOLD COAST: Ateiku, 100 m., shrub with white flowers in undergrowth of closed forest, May, *Vigne* 1948.

Gaertnera salicifolia *Hutch. et Gillett* in *Flora West Trop. Afr.* 2, 21 (1931) ; species foliis oblongis ad lanceolatis longe acuminatis, stipulis tubulosis mox deciduis, corollae lobis intra albo-villosis distincta.

Arbor 7 m. alta ; ramuli graciles, papilloso-pubescentes. *Folia* oblonga vel oblongo-lanceolata, apice longe acuminata et subacuta, basi acuta, 6-12 cm. longa, 1.5-3 cm. lata, nervis lateralibus utrinsecus circiter 5 puberulis exceptis glabra ; petioli 3-5 mm. longi, puberuli ; stipulae intrapetiolares mox deciduae, tubulosae ; tubus 5-10 mm. longus, puberulus, lobis filiformibus paucis 5-7 mm. longis. *Inflorescentia* terminalis, pauciflora, laxa, puberula ; bracteae lineari-filiformes, puberulae ; flores sessiles, ternati. *Receptaculum* extra puberulum. *Calyx* undulate dentatus, puberulus, 1.5 mm. longus. *Corolla* cylindrica, 7 mm. longa, dimidio superiori leviter et subito

ampliata, extra minutissime puberula; lobi 5, anguste oblongi, apice inflexi, 3 mm. longi, intra dense albo-villosi. *Antherae* fauce insertae, subsessiles, 1.5 mm. longae. *Ovarium* glabrum; stylus breviter bilobatus, apicem versus parce puberulus.

LIBERIA: Dukwia River, June, *G. P. Cooper* 277 (type).

Canoes are made from the wood, which is soft and works easily; the fruits yield an oil used for "crow-crow" itch. Vernacular name: *Mohr-ehu*.

VI—NOTES ON AFRICAN GRASSES: XXI.*

C. E. HUBBARD.

The following new species and new genus will be described more fully in a later number of the Kew Bulletin.

Agrostis Taylora C. E. Hubbard, sp. nov.; affinis *A. isopholi* C. E. Hubbard, sed culmis simplicibus basin versus exceptis enodibus, panícula usque ad 5 cm. lata, ramis plerumque binis, rhachilla minute producta glabra, lemmate glabro, arista longiore 2.5–4 mm. longa, palea 1 mm. longa differt.

UGANDA: Kigezi District; Mt. Muhavura, 3750 m., *Taylor* 2133 (type); Mt. Mgahinga, 3420 m., *Taylor* 1954.

Agrostis bryophila C. E. Hubbard var. ***elgonensis*** C. E. Hubbard, var. nov.; a typo differt culmis usque ad 10 cm. altis fasciculatis e rhizomate brevi ortis rigidis, foliorum laminis setaceis apice obtusis usque ad 5 cm. longis complicato-convolutis vel complicato-involutis, paniculis 1.8–3 mm. longis 1.2–1.8 cm. latis, rhachi rigida, ramis inferioribus usque ad 1.8 cm. longis, spiculis 4 mm. longis, lemmate fere 3 mm. longo, callo breviter barbato.

KENYA COLONY: Mt. Elgon, summit of unnamed peak between Koitoboss and Loven's Peak, 4250 m., *Taylor* 3703.

Leptagrostis C. E. Hubbard, gen. nov.; a *Calamagrosti* Adans. glumis valde inaequalibus inferiore superiore brevior, lemmate acute acuminato apice breviter aristato glumae superiori subaequali vel ea paullo longiore ut glumae tenuiter membranaceo, ligulis ad seriem ciliorum redactis differt.

Species 1, Abyssinia, ***L. Schimperiana*** (Hochst.) C. E. Hubbard, comb. nov. *Calamagrostis Schimperiana* Hochst. in *Flora*, 38, 202 (1855).

VII—MISCELLANEOUS NOTES.

Pterocarpus Draco L.—The case outlined below, which recently came to the writer's notice, illustrates well the application of the rule concerning "illegitimate names."

The name *Pterocarpus Draco* was published by Linnaeus (Sp. Pl. ed. 2, 1662: 1763) with references to five previous works: his own *Materia Medica* (1749); Jacquin, *Sel. Stirp. Amer. Hist.* (1763); Loeffling, *Iter Hisp.* (1749); Commelin, *Hort. Med. Amstel.* (1697);

* Continued from K.B. 1936, 501.

and Rumphius, *Herb. Amb.* (1750). Three of these references (Linnaeus, Commelin, Rumphius) refer to an Asiatic plant; the remaining two (Jacquin, Loeffling) to an American species to which Jacquin (l.c. 283) had given the name *Pterocarpus officinalis*. [Loeffling's work, though post-1753 and earlier than Jacquin, did not employ the binomial system of nomenclature.] It is evident from Linnaeus's reference to *Pterocarpus* in his *Mat. Med.* 184, where he cites his *Fl. Zeyl.* 196 (1747), that his conception of the plant was based primarily upon Commelin's description and figure (l.c. 1, 213, t. 109) of *Draco arbor indica siliquosa, populi folio, Angsana vel Angsava javanica*, which may therefore be regarded as the type of *Pterocarpus Draco* L.

Under International Rules, however, this name cannot be used for the species in question. Linnaeus regarded the Asiatic and the American plants as conspecific: consequently, as there already existed*, at the time of publication of *P. Draco* L., the valid name *P. officinalis* Jacq. for the American element, Linnaeus's name was superfluous, although based upon a different type. Article 60 (1) states that such superfluous names are illegitimate and must be rejected: "A name is illegitimate.....if it was superfluous when published, *i.e.* if there was a valid name (see Art. 16) for the group to which it was applied, with its particular circumscription, position and rank" (Briquet, *Intern. Rules*, ed. 3, 19: 1935).

The correct name for the Asiatic species is therefore *P. indicus* Willd. *Sp. Pl.* 3, 904 (1803), which has, fortunately, been universally adopted. For the American plant Willdenow wrongly employed the name *P. Draco* L., citing *P. officinalis* Jacq. in synonymy. Of *P. indicus* he states (l.c.): "ex icone Rumphii mihi tantum nota species."† He was therefore not at liberty to adopt the specific epithet *Draco* for the latter species (even had he not already wrongly used it for the former), as he would have been had he based it upon the *Linn. Mat. Med.* and Commelin references (*i.e.* the type of *P. Draco* L.), since in that case a later homonym would not have been created. *P. Draco* L. (*sensu stricto*) and *P. indicus* Willd., though universally regarded as conspecific‡, are actually based upon different types, originating from Java and Amboina respectively. The fact that the type of *P. indicus* was cited by Linnaeus, when publishing *P. Draco*, is immaterial.

H. K. AIRY-SHAW.

*As evidenced by the fact that Linnaeus cites Jacquin, whereas Jacquin only cites (erroneously) *Linn. Mat. Med.* and Rumphius, the latter with a query. In the later editions of his work ("*Pl. Amer. Pict.*" 98, t. 264, fig. 91: [1780]; "*cum approb. auct. ad exempl. maior. op....recusum*," 256: 1788) Jacquin employed the name *P. Draco* L., omitting all mention of his own *P. officinalis*.

†Cf. Merrill, *Interpr. Rumph. Herb. Amboin.* 270 (1917).

‡Rumphius himself (*Herb. Amb.* 2, 210, *observatio*: 1750) identifies his plant with that of Commelin, though noting that the latter's plate shows a plant with fewer leaflets. Commelin figured a young plant raised in the Amsterdam Botanic Garden from Javanese seed received from Andreas Cleyer.

The Algae and their Life Relations.*—This book will appeal to botanists in all English-speaking countries, for it is the first attempt, with the exception of Professor Fritsch's work, of which so far only one volume has appeared, to present in English a concise and comprehensive account of the algae.

The book opens with an account of the relationships of the major groups based on the theory of parallel development. In the second chapter, dealing with geographical range, the author stresses her belief that distribution depends largely on the illumination factor and she illustrates her conclusions from the distribution of the five great groups of algae in the Pacific Ocean. This is followed by a discussion on pigmentation and food reserves.

The main part of the work is concerned with classification, taking the simplest group, the *Cyanophyceae*, first and leading up to the *Chlorophyceae*. The scheme adopted is to set out in tabular form each class subdivided into orders, families and genera, and to follow this by a description of every group mentioned in the table. In this section the treatment seems rather disproportionate: for instance, in presenting the taxonomic table at the beginning of each section, one page is given to *Rhodophyceae*, while the *Phaeophyceae*, a much smaller class, is given one and a half pages, with the result that in the *Rhodophyceae* the family *Gigartinales* is represented by *Chondrus* only, while in the *Phaeophyceae* the treatment of *Lessoniaceae* extends to seven genera. Naturally the book has a North American bias, and this explains the inclusion among the brown algae of several monotypic genera such as *Pterygophora*, *Dictyonereis* and *Thalassiosiphon*, but it hardly warrants the absence of *Gigartina* among the red algae.

In the section on the *Chlorophyceae* a helpful comparison is given by the introduction of types from the higher plants and animals. There are numerous life-cycle diagrams and the book is well illustrated throughout. Finally there are interesting chapters on algae as a source of contamination, and as food for men and the lower animals. An appendix supplies useful instructions in drawing for publication.

Professor Tilden has quoted freely from well-known authors. Typographical errors seem to be comparatively few, but some obvious ones, such as "fructose" (page 30), and "Greek unda" (page 278), ought not to have escaped attention. Twenty-two pages of bibliography complete the book. It may without hesitation be recommended as an up-to-date text book for advanced students.

C. I. DICKINSON.

Poisons Law.†—With the present complexity of poisons regulations it is difficult to realise that such legislation is less than a century old. The first poisons act was passed in 1851 for the purpose

* By J. E. Tilden. Oxford University Press and University of Minnesota Press, London and Minneapolis, 1935. Pp. xii 550, figs. 257. Price \$5.00.

† By Hugh N. Linstead. The Pharmaceutical Press, London, 1936. Pp. 444. Price 5s.

of restricting the sale of arsenic which had come into prominence on account of its increasing use for criminal poisoning. The first Pharmacy and Poisons Act, which followed in 1868, formed the basis of pharmacy law up to 1933, when the present act became law. The acts of 1898, 1908 and 1929 introduced relatively slight changes, but the Dangerous Drugs Act of 1920 was an event of major importance, giving effect to the Hague Convention of 1912 on habit-forming drugs. The problem of drug addiction is international and has since been the sphere of much helpful work under the auspices of the League of Nations. The work of the League in this connection is outlined in a most interesting chapter on the "International background to the Dangerous Drugs Acts" contributed by Sir Malcolm Delevigne.

The present Pharmacy and Poisons Act follows very closely the recommendations of the Departmental Committee which was set up in 1926 and published its report in 1930. Of several important changes introduced, perhaps the most far reaching in its effects is the delegation of power to a Poisons Board to prepare a list of poisons and to amend it when necessary. The recommendations of the Poisons Board are subject to the approval of the Home Secretary, who is also empowered, in consultation with the board, to make rules for the regulation of the sale, storage, dispensing and other matters in relation to poisons. In this way, elasticity in the working of the act is provided for, at the same time achieving a desirable simplicity in the statute itself. It is evident that great care has been taken in the framing of the law to restrict the legitimate use of poisons as little as possible, while at the same time illegal use is made difficult.

The book deals in turn with each section of the Poisons and Pharmacy Act and the Dangerous Drugs Acts and Regulations, explaining their significance to all classes of individuals concerned with poisons. The texts of the various acts and rules, so far as they are at present in force, are given in a large appendix. A second smaller appendix listing the poisons commonly employed in pharmacy with a brief indication of the rules applying to them, should be invaluable to pharmacists. This work of reference should be on the shelves of all having frequent transactions in poisons.

R. MELVILLE.

Botanical Magazine.—The final part (part 4) of volume 159 was published on November 9th and contains the following dedication of the volume to Mr. C. T. Musgrave, together with his portrait: "To Charles Thomas Musgrave, B.A., V.M.H., J.P., a prudent and valued treasurer of the Society, eminent as a cultivator of rare and beautiful plants in two renowned gardens at Hascombe, both of them created by him and instinct with his spirit, a friend as generous of his knowledge of plants as of his experience of the law,

this volume of the Botanical Magazine is gratefully dedicated by the Royal Horticultural Society."

The following plants are figured:—*Catalpa Fargesii* Bur. forma *Duclouxii* (Dode) Gilmour (t.9458), from W. China; *Bulbophyllum orthoglossum* Wendland & Kraenzlin (t.9459), a native of the Philippine Islands; *Sorbus Prattii* Koehne (t.9460), a white-fruited Chinese species; *Mutisia subulata* Ruiz & Pavon (t.9461), a recent introduction from the Central Provinces of Chile; *Fritillaria glaucoviridis* Turrill (t.9462), from S. Asia Minor; *Herpetospermum pedunculatum* (Seringe) C. B. Clarke (9463), a native of N. India; *Rhododendron crinigerum* Franch. (t.9464), from S. E. Tibet and N. W. Yunnan; *Lewisia brachycalyx* Engelm. ex A. Gray (t.9465), recently re-introduced from Western North America; *Medinilla Scortechinii* King (t.9466), from the Malay Peninsula; *Magnolia globosa* Hook. f. & Thoms. (t.9467), extending from Sikkim to S. E. Tibet and N. W. Yunnan and *Gentiana cephalantha* Franch. apud Hemsl. (t.9468), a species from N. W. Yunnan, nearly allied to *G. rigescens* Franch., with which probably it hybridises.

Better Plants and Animals—A Survey of Superior Germ Plasm.—The Yearbook of Agriculture for 1936 of the United States Department of Agriculture* is a noteworthy departure from its predecessors of recent years. Instead of presenting brief summaries of miscellaneous new developments in American agriculture, 1022 out of a total of 1189 pages are devoted to "a survey of superior germ plasm made by the Committee of Genetics" set up by the Secretary of Agriculture. It deals with modern breeding research under the following crop headings, each written by recognised authorities on the subject; wheat, barley, oats, rice, maize, sorghum, sugarcane, sugar beet, cotton, flax and tobacco. In the matter of livestock it deals similarly with beef and dual-purpose cattle, dairy cattle, pigs, sheep, horses and mules, and poultry. The work comprises not only the immense amount of research achieved and in progress in the United States, but it has also been possible, by means of several questionnaires distributed to foreign countries that are working on the same problems, to enlarge greatly the scope of the survey. It says much for the manner in which such questionnaires have been prepared that the response has been most encouraging. "In the case of crop plants a wealth of material poured in dealing with breeding work in the past and present, much of which is not available elsewhere and could not have been obtained by any other method."

The book should prove of great value to all who are concerned in breeding work, whether with plants or animals.

* Published by the United States Department of Agriculture, 1936. Pp. 1189. Obtainable from the Superintendent of Documents, Washington, D.C. Price \$ 1.25.

Rots of English Oak.*—In the prefatory note it is stated that this is the first of a projected series of papers dealing with the fungi causing decay of the principal timber species.

The rots of oak are divided into three classes, those attacking the standing tree, those of felled and worked timber, and those occurring in buildings. Keys are given for the identification of the fungus according to the character of the rot. Under each heading the chief fungi concerned are described macroscopically, the gross and microscopic characters of the rot are given, growth of the fungus in culture and any physiological data are described, and finally the economic importance of the fungus is discussed. Fungi of minor importance are listed and briefly described. Finally there is a brief account of various stains and discolorations of oak wood, and a list of literature referred to. The paper is illustrated by 13 excellent plates, taken from photographs, showing cultures and fruit-bodies of some of the fungi, and various types of rot.

The work is a most useful summary of existing information as to the rots of oak, and its successors will be awaited with interest.

E. M. WAKEFIELD.

Carnations.†—This handbook, compiled by an acknowledged authority on this subject, opens with an informative chapter on the history and improvement of the various types of carnations and garden pinks. The cultivation of the different sections, from the initial stages of propagation to the final flowering, is then dealt with in such a clear and simple manner that beginners should have no difficulty in understanding the various cultural processes described. There are also chapters dealing with hybridising, seed raising, diseases, insect pests, greenhouses, and the preparation of the blooms for floral decoration and exhibition.

An interesting feature of the book is a series of short articles dealing with the cultivation of the carnation in no less than twelve different countries, each section being written by an expert in the particular country.

The book is profusely illustrated and well printed; it forms an attractive volume which is likely to be the last word on the subject for a good many years.

J. COUTTS.

* "The Principal Rots of English Oak." By K. St. G. Cartwright and W. P. K. Findlay. Published by H.M. Stationery Office, 1936. Pp. 38, 13 plates. Price 2s. net.

† "Carnations and All Dianthus." By Montagu C. Allwood, F.L.S., with a Foreword by Lord Aberconway, C.B.E., V.M.H. Allwood Bros., Haywards Heath, Sussex, no date [1935]. Pp. xxiv+215, 156 plates. Price 12s. 6d.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 2, 1937 ROYAL BOTANIC GARDENS, KEW

VIII—LIAISON OFFICERS AT THE ROYAL BOTANIC GARDENS, KEW. THE COMMONWEALTH OF AUSTRALIA.

The history of liaison officers at Kew was given by the President at the meeting of the Third Imperial Botanical Conference on August 30th, 1935.* At that meeting the following resolutions, relating to a liaison officer from Australia, were proposed by Dr. G. P. Darnell-Smith, Delegate of the Commonwealth of Australia; seconded by Professor R. B. Thomson, Toronto, and carried unanimously after the proposals had been fully supported by several overseas botanists:—

(1) This Conference commends to the Government of the Commonwealth of Australia the importance of maintaining close liaison in botanical matters with the Royal Botanic Gardens, Kew, and urges the Government to consider favourably the appointment of one of the younger Australian Systematic Botanists to work at Kew for a period of at least two years in making a critical examination of the historic Australian type-specimens at Kew and the British Museum, and determining current collections made in the Commonwealth and sent over to Kew for critical examination.

(2) It is further suggested that, at the expiry of his term of service, the officer appointed as Assistant for Australia should be replaced by another of the younger Australian Systematic Botanists.

Copies of these resolutions were forwarded on October 1st, 1935, to the High Commissioner for Australia and to Sir David Rivett, Chief Executive Officer of the Commonwealth Council for Scientific and Industrial Research, to which Council the suggestion of the value of an Australian liaison officer at Kew was originally made in the Director's Report to the Executive Committee of the Commonwealth Council for Scientific and Industrial Research after his visit to Australia in 1927-28.

On February 13th, 1936, information received from the Prime Minister's Department, Canberra, was forwarded to Kew from Australia House to the effect that it was being proposed to bring the matter of the appointment of "A liaison Officer between the Royal Botanic Gardens, Kew, and the Commonwealth of Australia" before the Standing Commission on Agriculture at its next meeting; this Commission includes among its members the Permanent Head of each State Department of Agriculture.

* Report of the Third Imperial Botanical Conference, London, August, 1935. Pp. 16-19.

On July 30th, 1936, the Official Secretary, Australia House, transmitted the following information received from Canberra :—

“ Members of the Standing Committee expressed their approval of the proposal for the appointment of liaison officers and the following resolution was passed unanimously :—

‘ The Standing Committee on Agriculture supports the resolution passed by the Imperial Botanical Conference and commends it for the favourable consideration of the States.’

“ Since the meeting of the Standing Committee, the attention of the Permanent Head of each of the State Departments of Agriculture has been drawn to the foregoing resolution and information has been sought as to the nature of any action which it is intended to take in order to give effect to the proposal for the appointment of liaison officers. It is understood that the Department of Agriculture in Western Australia is desirous of arranging for the Government Botanist (Mr. C. A. Gardner) to be appointed as liaison officer, and that the matter is receiving the attention of the Director of Agriculture in that State.”

A private letter of September 7th, 1936, from Mr. C. A. Gardner, Government Botanist, Department of Agriculture, Perth, Western Australia, which reached Kew on October 8th, conveyed the welcome news that he had been granted permission by the Government of Western Australia to come to Kew as liaison officer for the Commonwealth. This was followed by an official letter (dated 23rd October, 1936), from the Secretary of the Council of Scientific and Industrial Research, stating that the Council had been able to arrange with the Western Australia Department of Agriculture for Mr. C. A. Gardner to be attached to Kew as liaison officer.

A letter from Australia House, dated December 23rd, 1936, conveyed information as to Mr. Gardner's appointment similar to that which had been received from the Department of the Prime Minister. The letter also gave the further valuable information that “ it is proposed that Mr. Gardner shall remain at Kew for at least two years and that he shall be replaced by another officer at the end of his service.”

It is very gratifying that the proposal first put forward in a Report to the Executive Committee of the Commonwealth Council for Scientific and Industrial Research has now been adopted and that the Government of the Commonwealth of Australia has followed the examples of the Government of India and the Government of the Union of South Africa in appointing a liaison officer to work in the Kew Herbarium.

Similar resolutions to those recorded above were passed with regard to the Dominion of Canada and the Dominion of New Zealand, and have been sympathetically received by the respective Governments. It seems possible that a liaison officer for New Zealand may be appointed in the near future.

IX—CONTRIBUTIONS TO THE FLORA OF SIAM.
ADDITAMENTUM XLII.—TWO NEW GENERA OF VERBENACEAE
FROM SIAM.

Garrettia Fletcher, gen. nov. [Verbenaceae-Caryopterideae]; *Caryopteridi* Bunge affinis, sed calyce haud lobato, staminibus vix exsertis, labio postico haud fimbriato differt.

Frutex, foliis oppositis simplicibus vel trifoliolatis serratis. *Cymae* dichotomae et trichotomae, axillares vel in paniculam foliatam terminalem coarctatae. *Calyx* campanulatus, 5-dentatus vel fere integer sub fructu ampliatus. *Corollae* tubus et limbus subaequales; limbus bilabiatus, labio posteriore bifido, inferiore trifido. *Stamina* 4, duo longiora exserta, duo breviora; antherae dorso insertae. *Ovarium* primo 2-loculare, mox 4-loculatum loculis uniovulatis; stigma breviter bifidum. *Fructus* maturus globosus, in valvas 4 pyrenas auferentes dehiscens.

Garrettia siamensis Fletcher, sp. nov., adhuc unica.

Frutex circa 1.2 m. altus (ex Garrett); ramuli quadrangulares, conspicue puberuli, lenticellis paucis, cortice brunneo obtecti. *Folia* simplicia, interdum trifoliolata, ovata, apice attenuata, acuta vel obtusa, basi rotundata nunc subito decurrentia vel leviter cordata, 5–10 cm. longa, 2–5 cm. lata, membranacea, supra brunnea, subtus pallidiora et saepe griseo-brunnea, utrinque adpresso-puberula et aureo-glandulosa, nervis supra subconspicuis, costa subtus prominente, nervis lateralibus 4–6-paribus subtus prominulis parallelis intra marginem arcuatim junctis, margine serrata sparse ciliolata, petiolo 1–10 cm. longo supra canaliculato puberulo suffulta. *Cymae* puberulae, dichotomae et interdum trichotomae, multiflorae vel submultiflorae, 1.5–3 cm. longae, laterales vel in paniculam foliatam terminalem coarctatae; pedunculi graciles, 1–1.5 cm. longi; pedicelli 0.5–1 mm. longi; bracteae minutae. *Calyx* extra sparse puberulus et flavo-glandulosus, c. 1.5 mm. longus, 5-nervatus, 5-dentatus vel fere integer. *Corolla* extra glabra vel sparse puberula; tubus 1.5–2 mm. longus, ad staminum insertionem sparse pubescens, eglandulosus; limbus bilabiatus, flavo-glandulosus; labium posticum 1 mm. longum, bilobatum, labium inferum trilobatum, 2 mm. longum; 2–2.5 mm. latum. *Stamina* 4, supra tubi corollini basin 1.5 mm. adfixa, filamentis duobus 2 mm. longis, ceteris 1.5 mm. longis; antherae 0.5 mm. longae, minute papillosae. *Ovarium* globosum, glabrum, 0.75 mm. diametro; stylus 2–2.5 mm. longus. *Fructus* globosus 1.5–2 mm. diametro, flavo-glandulosus.

Doi Chiengdao, north of Ban Tam, c. 420 m., Garrett 988.

Fruit characters clearly place this genus in the tribe *Caryopterideae*, which includes the genera *Peronema*, *Hymenopyramis*, *Glossocarya*, *Caryopteris* and a recently described genus from Annam, *Karomia*, all of which are characterized by having a capsule which dehisces by four valves into four, 1-seeded pyrenes. The imparipinnate leaves and two stamens of *Peronema*, the greatly enlarged calyx

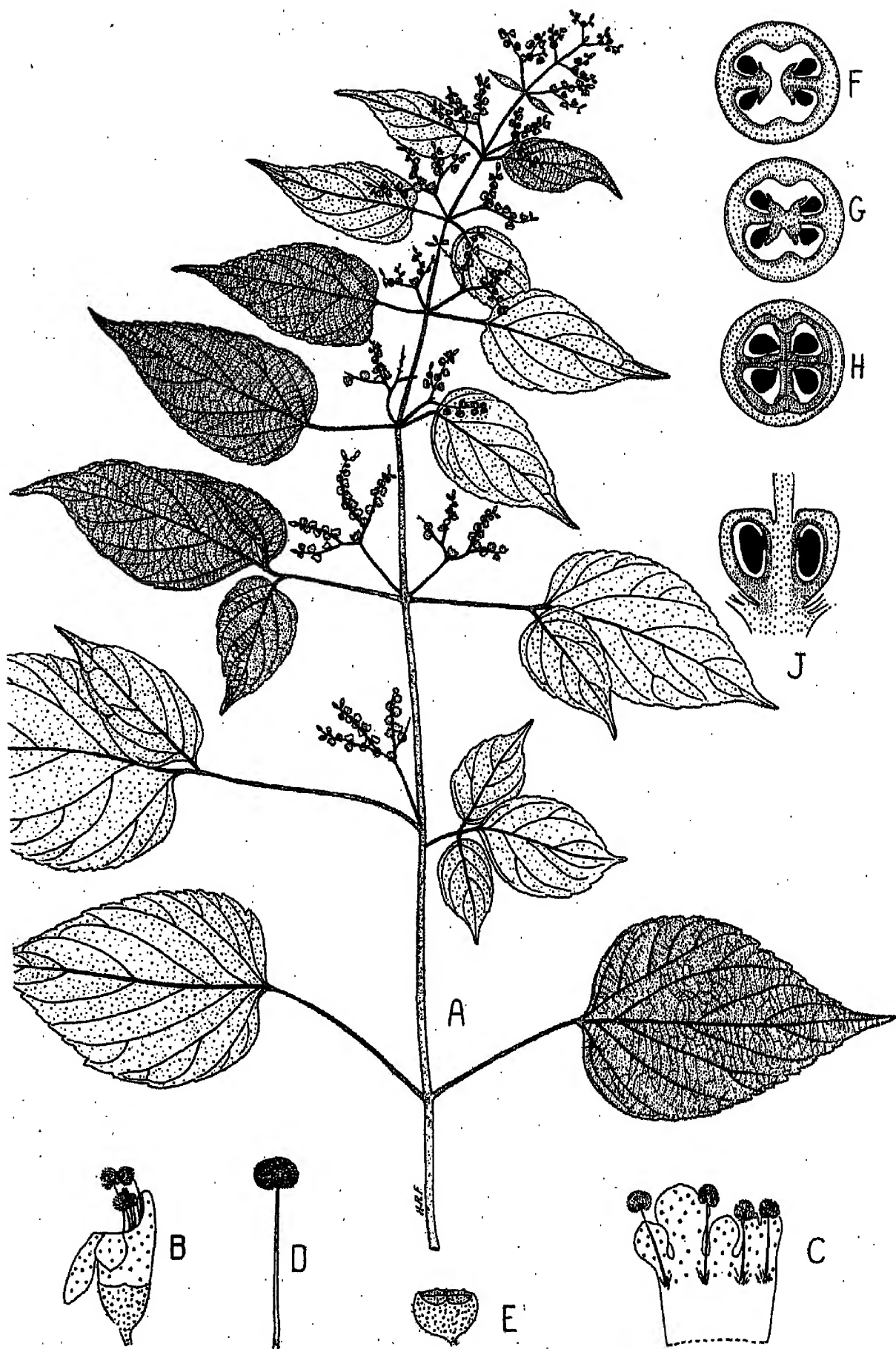


Fig. 1. *Garrettia siamensis* Fletcher. A, twig ($\times \frac{1}{2}$); B, flower ($\times 2\frac{1}{2}$); C, corolla laid open ($\times 2\frac{1}{2}$); D, stamen ($\times 5$); E, calyx enclosing fruit ($\times 2\frac{1}{2}$); F, G, H, diagrammatic transverse sections of the ovary showing stages in its development; J, diagrammatic longitudinal section of the ovary.

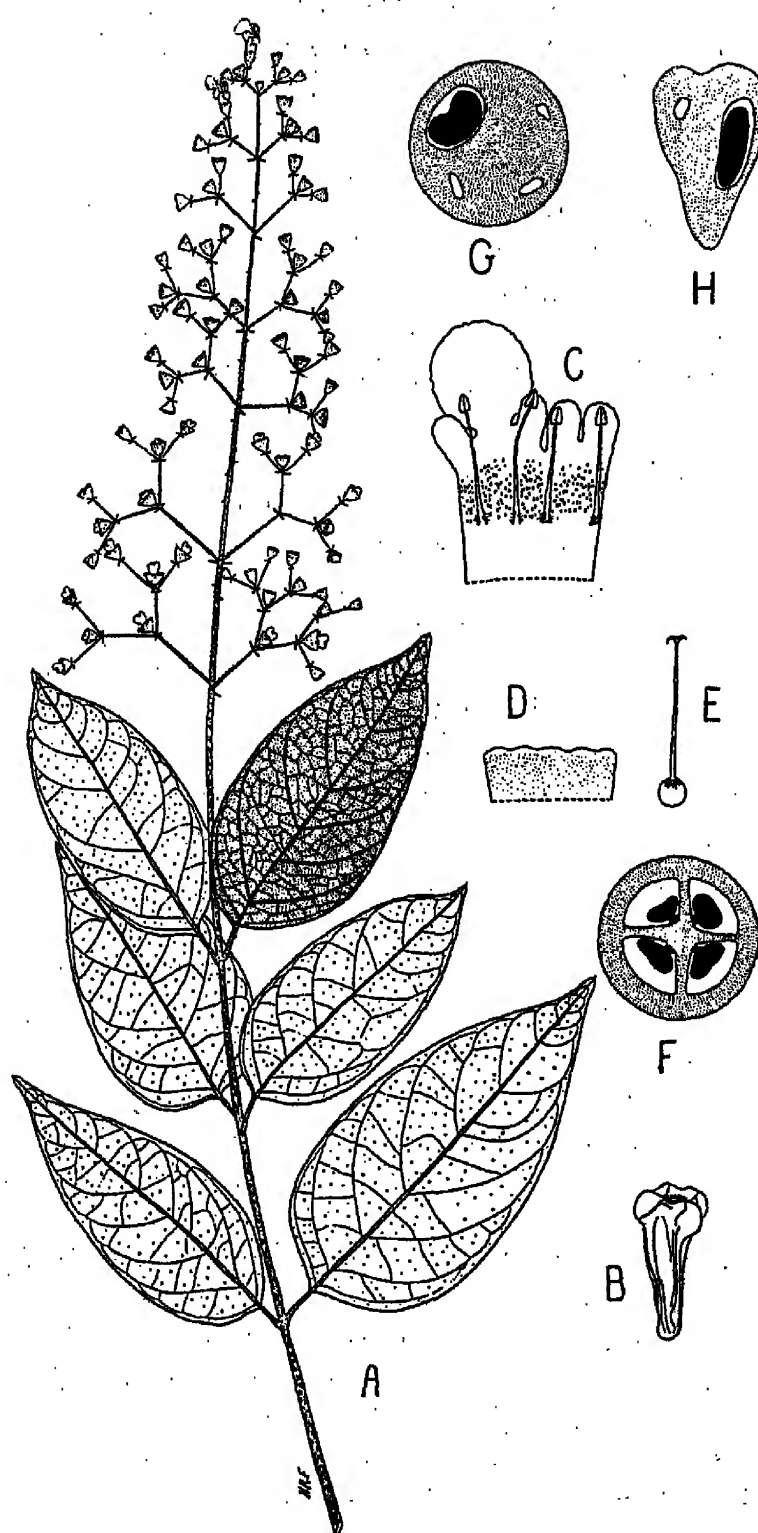


Fig. 2. *Paravitex siamica* Fletcher. A, twig ($\times \frac{1}{2}$); B, fruit ($\times 2$); C, corolla laid open ($\times 2$); D, calyx laid open ($\times 2$); E, style and ovary ($\times 2$); F, diagrammatic transverse section of the ovary; G, diagrammatic transverse section of the fruit; H, diagrammatic longitudinal section of the fruit.

surrounding the fruit of *Karomia*, the greatly accrescent 4-winged utricular calyx of *Hymenopyramis*, and the oblong exserted capsule of *Glossocarya*, clearly forbid its inclusion in any of these genera. Undoubtedly its nearest affinity is with *Caryopteris* which differs in having a deeply 5-fid calyx, greatly exserted stamens, and the posterior lip of the corolla usually fimbriate or toothed.

The leaves are often trifoliolate. Apart from *Peronema* the only other genus of *Verbenaceae* with compound leaves is *Vitex* which has leaves both simple and 3-5-digitate. In *Vitex*, however, the fruit is a 2-4-seeded succulent drupe.

The plant was collected in Northern Siam, on Doi Chiengdao (2185 m.), the second highest mountain within the boundaries of Siam, from which over 30 endemic species are so far known, and is named in honour of the collector, Mr. H. B. G. Garrett of the Forest Service.

Paravitex Fletcher, gen. nov. [Verbenaceae-Viticeae]; *Vitici* Linn. affinis sed foliis simplicibus, drupis semper monospermis differt.

Frutex foliis oppositis simplicibus integris. *Cymae* dichotomae et trichotomae, in paniculam terminalem laxam dispositae. *Calyx* campanulatus, truncatus vel sinuato-lobatus. *Corollae* limbus bilabiatus, labio posteriore bifido, inferiore trifido, lobo medio multo longiore. *Stamina* 4, vix exserta; filamenta basi sparse pubescentia; antherae dorso insertae. *Ovarium* 4-loculatum, loculis uniovulatis; stigma bifidum. *Fructus* globosus obovoideus monospermus 4-loculatus, loculis tribus abortivis.

Paravitex siamica Fletcher, sp. nov., adhuc unica.

Frutex scandens (ex Kerr); ramuli primo quadrangulares mox teretes, glabri, glandulis paucis sucineis lenticellisque numerosis muniti. *Folia* simplicia, ovata vel elliptica, apice acuta vel obtusa vel obtuso-apiculata, basi leviter attenuata vel saepius rotundata, 3-8 cm. longa, 2-4 cm. lata, chartacea, supra brunnea subtus brunneo-grisea, utrinque glabra nervis parce pubescentibus exceptis, subtus glandulis sessilibus sucineis praedita, costa supra conspicua subtus prominente, nervis lateralibus 7-9-paribus subtus prominulis parallelis intra marginem arcuatim junctis, margine integra, petiolo 0.5-1 cm. longo parce pubescente glanduloso suffulta. *Inflorescentia* terminalis, 10-22 cm. longa, basi 6-10 cm. lata, sparse spinulosa, pubescens, glandulosa; bracteae 1-3 mm. longae. *Calyx* glaber, 2-5 mm. longus, truncatus, vel sinuato-lobatus, glandulosus. *Corolla* extra glaber, glandulosa; tubus 5.5 mm. longus, intra glaber nisi ad staminum insertionem ibique tenuiter pubescens; limbus bilabiatus; labium posticum 2 mm. longum, bilobatum, labium inferum 5 mm. longum, trilobatum, lobis apice rotundatis. *Stamina* 4; filamenta 5-7 mm. longa, supra basin tubi corollini 2 mm. adfixa; antherae 0.75 mm. longae. *Ovarium* globosum, 1 mm. diametro, glabrum, apice glandulosum; stylus 7.5 mm. longus, bilobatus. *Fructus* obovoideus, 7 mm. longus, glaber, rugosus, ad apicem parce glandulosus.

Krabin, Aran Pratet, under 50 m., evergreen forest by stream, *Kerr* 19329 ; Angtawng, *Put* 2573 ; Bangpa-in, c. 6 m., waste ground, *Marcan* 1004 ; Supan, Dom Bang, c. 20 m., banks of river, *Kerr* 7002 (type).

This genus belongs to that part of the tribe *Viticeae* which is characterized by having irregular flowers and an indehiscent fruit and which includes the genera *Premna*, *Vitex* and *Gmelina*.

Premna is distinct in having the corolla consistently 4-partite and the anthers opening by a circular pore. *Gmelina* and *Vitex* both have the stamens dehiscing by longitudinal slits ; in *Gmelina*, however, the flowers, with the corolla 4-5-lobed, are much larger than those of *Vitex*, the corolla of which is always 5-partite. Apart from this *Vitex* is clearly distinct in having, with one varietal exception, digitate leaves.

Paravitex, as the name implies, is most closely related to *Vitex*. The two characters which clearly separate it from this genus are the simple leaves and the structure of the fruit. The ovary of *Vitex* is normally 4-celled and 4-ovuled, although the number varies from 2 to 4. Each cell, however, is fertile so that the drupe is 2-4-celled and 2-4-seeded. *Paravitex* differs in that, although the ovary is 4-celled and 4-ovuled, only one of the cells develops. Thus the drupe contains one fertile cell with one seed and three seedless rudimentary cells.

X—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXIX.* THE GENUS PERIPTERA. A. A. BULLOCK.

The history of the Malvaceous genus *Periptera* DC. up to the year 1890, was given in detail by Rose (in *Contr. U.S. Nat. Herb.* 5, 173 : 1899), when he described a second species, *P. macrostelis* Rose. Hochreutiner (in *Ann. Cons. et Jard. Bot. Genève*, 20, 30 et seq. : 1916), in his monograph of *Anoda* Cav., overlooked Rose's paper, and returned to K. Schumann's opinion (in *Mart. Fl. Bras.* 12, 3, 357 : 1894) that *Periptera* should be treated as a section of *Anoda*, a course which E. G. Baker had previously followed in 1892 (in *Journ. Bot.* 30, 74 : 1892). *Periptera*, however, in its erect petals and long-exserted staminal column is more readily distinguishable from *Anoda* than is the latter genus from *Sida* L. In his treatment of *Anoda*, A. Gray (in *Proc. Amer. Acad.* 22, 297 : 1897), made no mention of *Periptera*, and he regarded *Anoda incarnata* H.B.K. (= *P. punicea*) as a doubtful species, perhaps of another genus.

Hochreutiner recognised only one species of *Periptera* (under *Anoda*), but he described a variety which is here raised to specific rank. A further hitherto undescribed species is added, which brings the total to four species, and provides an interesting geographical distribution for the genus as follows :—

* Continued from K.B. 1936, 392.

1. *P. punicea* (Lag.) DC. ... State of Jalisco
2. *P. macrantha* Bullock ... States of Mexico, Guerrero
and Michoacan
3. *P. macrostelis* Rose ... State of Jalisco
4. *P. trichostemon* Bullock ... State of Sinaloa

Material of *Periptera*, including the type of *P. macrostelis* Rose, has been kindly sent to Kew on loan from the United States National Herbarium, and also the type material of *Anoda periptera* var. *macrantha* Hochr. from the Delessert Herbarium. These specimens have been cited, in addition to those in the Kew Herbarium.

Clavis Specierum.

Columna staminalis glabra vel pilis brevibus simplicibus leviter pubescens :

Petala anguste spathulata, circiter 2 mm. lata, interdum paullo latiora :

Columna staminalis usque ad 1.8 cm.

longa, saepe brevior1. *P. punicea*

Columna staminalis 2.5-3.5 cm. longa2. *P. macrantha*

Petala late inaequilateraliter obovata, circiter

8 mm. lata.....3. *P. macrostelis*

Columna staminalis pilis stellatis manifeste

pubescens4. *P. trichostemon*

1. *Periptera punicea* (Lag.) DC. in DC. Prodr. 1, 459 (1824) ; G. Don, Gen. Syst. 1, 490 (1831) ; Conzatti, Gen. Veg. Mex. 119 (1903). *P. periptera* (Sims) Rose in Contr. U.S. Nat. Herb. 5, 173, fig. 29 (1899). *Sida periptera* Sims in Bot. Mag. t. 1644 (1814). *S. rubra* Ten. Cat. Hort. Neap. 96 (1813), nom. nud. *Anoda punicea* Lag. Gen. et Sp. Nov. 21 (1816) ; K. Schum. in Mart. Fl. Bras. 12, 3, 357 (1891) in obs. ; E. G. Baker in Journ. Bot. 30, 74 (1892), et Syn. Gen. Sp. Malv. 47 (1894).* *A. incarnata* H.B.K. Nov. Gen. et Sp. 5, 266 (1821). *A. rubra* [Ten. ex] Hochr. Malv. Nov. 33, Genève (1902), et in Ann. Cons. et Jard. Bot. Genève, 6, 42 (1902) ; *A. periptera* (Sims) Hochr. in Ann. Cons. et Jard. Bot. Genève, 20, 41 (1916).

STATE OF JALISCO. Rio Blanco, June-Oct. 1886, *Palmer* 604 ; cañons in the mountains near Lake Chapala, Nov. 1892, *Pringle* 4356 ; Sierra Madre, west of Bolaños, 1500-2280 m., Sept. 1897, *Rose* 2945 (U.S.) ; on the road between Bolaños and Guadalajara, Sept. 1897, *Rose* 3046 (U.S.) ; near Guadalajara, Sept. 1903, *Rose and Painter* 7457 (U.S.) ; near Chapala, Oct. 1903, *Rose and Painter* 7647 (U.S.) ; Guadalajara, Oct. 1903, [ex herb.] *Holway* 5150 (U.S.) ; Sept. 1886, *W. Schumann* 379 (U.S.).

This is the original species, first described by Sims as a very remarkable species of *Sida*, and segregated by De Candolle as a monotypic genus. Compared with the other three species, the

* This is a reprint of the papers which appeared in the Journal of Botany between 1890 and 1894.

staminal column is relatively short. It is apparently confined to Jalisco, and was described from a cultivated specimen.

2. *Periptera macrantha* (Hochr.) Bullock, stat. et comb. nov. *Anoda periptera* (Sims) Hochr. var. *macrantha* Hochr. in Ann. Cons. et Jard. Bot. Genève, **20**, 43 (1916).

STATE OF MICHOACAN. Rincón, Morelia, 1850 m., Sept. 1909, *Arsène* 64 (typus in Herb. Deless*); *ibid.*, 1950 m., Sept. 1910, *Arsène* s.n.; *ibid.*, 1900 m., June 1909, *Arsène* 2710 (U.S.); *ibid.*, 1850 m., Sept. 1909, *Arsène* 2542 (U.S.); *ibid.*, 1900 m., Sept. 1910, *Arsène* 5286 (U.S.); Cerro Azul, Morelia, 2100 m., Sept. 1911, *Arsène* 6051 (U.S.); Cerro San Miguel, Morelia, 2100 m., Sept. 1910, *Arsène* 6933 (U.S.); *ibid.*, 2200 m., Nov. 1910, *Arsène* 6798 (U.S.); Punguato, Morelia, 2100 m., Nov. 1911, *Arsène* 6051; *ibid.*, 1980 m., Aug. 1910, *Arsène* 6706 (U.S.); San Maria, 2100 m., Oct. 1911, *Arsène* 3 (Herb. Deless.).

STATE OF MEXICO. District of Temascaltepec: San Jose, Feb. 1932, *Hinton* 285; Temascaltepec, 1750 m., Nov. 1932, *Hinton* 2400; *ibid.*, Feb. 1934, *Hinton* 5587; *ibid.*, Nov. 1934, *Hinton* 6808; *ibid.*, Jan. 1935, *Hinton* 7216; Cumbre de Tejupilco, 2000 m., Nov. 1932, *Hinton* 2701; *ibid.*, Feb. 1934, *Hinton* 5581; *ibid.*, Nov. 1934, *Hinton* 7015; Ypericones, Nov. 1934, *Hinton* 6997.

STATE OF GUERRERO. Between Ayusinapa and Petatlan, 1500–2100 m., Dec. 1894, *Nelson* 2115 (U.S.).

The very long staminal column and longer petals of this species, in conjunction with its geographical separation from *P. punicea*, constitute, in my opinion, sufficient evidence for raising it from varietal to specific rank.

3. *Periptera macrotselis* Rose in Contr. U.S. Nat. Herb. **5**, 174, t. 19 (1899).

STATE OF JALISCO. Near San Sebastian, 1140–1500 m., March 1897, *Nelson* 4086 (U.S.); *ibid.*, 1425 m., in a shaded, damp spot on wooded banks of a stream at the bottom of a cañon, Jan. 1927, *Ynes Mexia* 1393 (U.S.).

This species has been collected only twice, and is not represented in the Kew herbarium. It is at once distinguished from all the other species by its broad petals. The staminal column is long, as in *P. macrantha*, but there is no possibility of confusion arising between the two species.

4. *Periptera trichostemon* Bullock, sp. nov., inter species hactenus cognitae calyce multo majore, columna staminali stellato-pubescente valde distincta.

Frutex vel *suffrutex*; ramuli floriferi tantum visi. *Ramuli floriferi* stellato-pubescentes, basin versus foliosi, superne floribus

* Hochreutiner did not indicate which of the two specimens (*Arsène* 64, *Arsène* 3) he cited was to be the type; as this is the better specimen, I have chosen it.—A.A.B.

pedicellatis racemiformiter dispositis praediti. *Folia* plus minusve triangularia, basi hastata, superne gradatim minora, utrinque stellato-pubescentia, apice acuta, basi truncata, marginibus plus minusve serrato-dentatis; folia basi ramulorum floriferorum circiter 3 cm. longa et 2 cm. lata, haec tantum visa, petiolis dense stellato-pubescentibus sesquolongiora; stipulae ut videtur deciduae. *Flores* rubri, racemiformiter dispositi, pedicellis 3.5–4 cm. longis ex axillis bractearum ortis, bracteis stipulisque subulatis 2–4 mm. longis. *Calyx* 1.4 cm. altus, 10-nervius, 5-lobatus, extra dense stellato-pubescentia, intus basin versus praesertim plus minusve pilis simplicibus pubescens; lobi triangulares 1.1 cm. longi, basi 5 mm. lati, apice acuti, mucronati. *Petala* "rubra, carnosa," spathulata, 1.4–1.6 cm. longa, apicem versus circiter 3 mm. lata, inferne dense stellato-pubescentia, superne glabra, apice late bidentata. *Columna staminalis* circiter 3.5 cm. longa, manifeste stellato-pubescentia, filamentis subulatis 2.5–3 mm. longis glabris numerosis apice aggregatis; antherae 0.75 mm. longae, minute papillosae. *Ovarium* disciforme, ut videtur circiter 14-carpellatum, 2.5 mm. diametro, stellato-tomentosum. *Stylus* vix 3 cm. longus, basin versus tantum leviter stellato-pubescentia, apice in ramulos stigmatosos circiter 14 divisus; ramuli stigmatosi inaequales, filiformes, apice clavati. *Fructus* non visi.

STATE OF SINALOA. Las Cuevas, 150 m., 1922, *Ortega* 800 (typus in U.S. Nat. Herb., dupl. in Herb. Kew.); camino para las Cuevas, Cosala, 150 m., March 1919, *Montes and Salazar* 800 (U.S.).

This is evidently a very rare plant; a manuscript note on the Montes and Salazar specimen reads, "The only plant found. Petals fleshy, red." Ortega gives the vernacular name *Conitaca*.

SPECIES DUBIAE VEL EXCLUSAE

1. *Sida Malvaviscus* Sessé et Moc. Fl. Mex. Ic. ined., ex DC. in DC. Prodr. 1, 459 (1824) in syn., et auctt. omn. in syn.

In view of the absence of Sessé and Mociño's type, it seems doubtful whether this can be referred with certainty to *P. punicea* (Lag.) DC., as all authors have done hitherto. *P. punicea* occurs only in Jalisco, where it is not, apparently, common; here also occurs the rare *P. macrostelis* Rose. *P. macrantha* Bullock, on the other hand, is relatively common in Mexico (State), Michoacan and Guerrero. Sessé and Mociño's plant might be any of these three species, but chance would indicate the last as being the most likely.

2. *Periptera megapotamica* (Spreng.) G. Don, Gen. Syst. 1, 490 (1831), based on *Sida megapotamica* Spreng. Syst. Tent. Suppl. 19 (1828), is *Abutilon megapotamicum* (Spreng.) St. Hil. et Naud. in Ann. Sc. Nat. Sér. 2, 18, 49 (1842), a native of southern Tropical America.

XI—ON THE FLORA OF THE NEARER EAST: XVIII*.
NEW SPECIES, NEW RECORDS, AND NOTES. W. B. TURRILL.

Glycyrrhizopsis syriaca Turrill, sp. nov.; a *G. flavescens* Boiss. et Bal. in omnibus partibus minus pubescenti-hirtula, calycibus fere glabris facile distinguitur.

Caules sparsissime pubescentes vel fere glabri, longitudinaliter angulato-sulcati, rubelli, in nodis glandulis stipitatis instructi. *Folia* 5-7-juga, 6-13 cm. longa, rhachide glabra vel sparsissime pubescenti; foliola anguste elongato-elliptica vel anguste oblanceolata, apice subacuta saepe apiculata, basi angustata, 1.3 (inferiora) -2.8 (superiora) cm. longa, 4-7 mm. lata, costa in pagina superiore impressa, in pagina inferiore valde prominente et costa sparse (in foliis junioribus densioribus) pilosa, marginibus pilosis vel pilosulis, supra viridia, infra pallide vel cinereo-viridia, petiolulis 2 mm. longis; stipulae lanceolatae, acuminatae, 1-1.2 cm. longae, 3 mm. latae vel angustiores. *Racemus* 14-15 cm. longus (pedunculo 6-7 cm. incluso), 30-40-florus; pedicelli 1-2 mm. longi; bracteae angustissime lineari-oblanceolatae, apice acutae, inferne angustatae, circiter 1.1 cm. longae et 1 mm. latae, leviter pilosulae margine praecipue, purpurascens. *Calyx* glaber vel fere glaber, tubo 5-5.5 mm. longo 2-2.5 mm. diametro haud gibboso, dentibus adaxialibus conniventibus triangulari-lanceolatis acutis 1.5-2 mm longis 1 mm. latis, dente abaxiali anguste triangulari-lanceolato acuminato 6 mm. longo 1.5 mm. lato, dentibus lateralibus anguste lanceolatis breviter acuminatis 5 mm. longis 1.5 mm. latis, dentibus omnibus leviter ciliolatis. *Vexilli* lamina rhomboidea, apice rotundata, 1.5 cm. longa, 1 cm. lata, basi in petiolum 3 mm. longum angustata; alae 1.4 cm. longae, liberae, laminis anguste oblique oblongis apice rotundatis 1 cm. longis 3 mm. latis; carina 1.4 cm. longa, laminis oblique spathulatis apice oblique truncatis et breviter apiculatis 8.5 mm. longis. *Filamenta* circiter 1.3 cm. longa. *Gynoecium* glabrum, ovario biovulato breviter cylindrico 4 mm. alto, stylo 1 cm. longo.

SYRIA: a few miles to the west of Antioch, on a pass, April 1936, G. P. Baker.

Glycyrrhiza glabra L., in the broad sense in which the species is accepted in Boissier, *Flora Orientalis*, 2, 202 (1872), is a very polymorphic species with a wide distribution throughout the Mediterranean Region and into S.E. Central Europe, Russia, and Central Asia. No inclusion of yellow-flowered plants within the species has, however, been made by any of the authors consulted. Post, *Flora of Syria, Palestine, and Sinai* ed. 2 (ed. Dinsmore) 371 (1932), retains *G. glabra* L., with vars *typica* Reg. et Herd. and *violacea* Boiss., with blue and violet corollas respectively, and *G. glandulifera* W. et K. as species. *G. echinata* L., a species widely differing from the above and from our plant in inflorescence and flower structure and *G. flavescens* Boiss. are also recorded from Syria in the same work. Bouloumoy, *Flore du Liban et de la Syrie*,

*Continued from K.B., 1936, 103.

93-4 (1930) records *G. echinata* L., *G. glabra* L., and *Glycyrrhisopsis flavescens* (Boiss.) Boiss. et Bal.

The genus *Glycyrrhisopsis* was established by Boissier and Balansa in Boiss. Diagn. 2, v, 81 (1856), with the one species *G. flavescens* (Boiss.). This had originally been described by Boissier, in Diagn. 1, vi, 33 (1845), as *Glycyrrhiza flavescens*, with the type as Aucher No. 994, collected "in Cilicia circa Adana." Boissier and Balansa add the following specimens: "circâ Mersina ad pagum Bouloukli cl. Balansa floriferam fine Aprilis, fructiferam ineunte Junio, in sylvis ad basin montis Cassii in viâ a Laodiceâ ad Suadieh in Syriâ Boiss. Jun. 1846 fructif." In Boissier's Flora Orientalis, 2, 204 (1872) the same specimens are quoted, with the addition of "in sylvis Amani supra Beilan alt. 4,000' (Ky. exs. 41!)."

In the Kew Herbarium specimens are present of *Aucher-Eloy* 994 and of *Balansa* 495 (in flower and fruit). In addition there is a flowering sheet written up "1521 *Glycyrrhiza lutea* (Nob.) in Ciliciâ (Asiâ Minor) primovere 1834 Montbret," and certainly the same as *Aucher-Eloy* 994. Lastly, a fruiting sheet, with a printed label, must be mentioned: "Theodor Kotschy. Pl. Syreæ bor. ex Amano prope Beilan 1862. 51. *Glycyrrhisopsis flavescens* Boiss. In sylvis montanis Amani versus Apisch Gaja alt. 4000' 20. Junii."

Boissier and Balansa evidently felt some doubt as to the conspecificity of the Asia Minor and Syrian plants for they note (l.c., 1856): "Planta Syriaca (cujus flores non vidi) habet legumina paululum compressiora, semina paululum compressiora, semina paululum minora, obscuriora, obsoletius punctata." A comparison of the fruiting material of *Kotschy* 51 (Syria) with that of *Balansa* 495 (Cilicia) in Herb. Kew. shows that there are differences, the Syrian plant having narrower less long tapering legume valves and much smaller seeds. Unfortunately the available material is insufficient to settle the exact distribution of *G. flavescens*, but it is possible it does not occur in Syria and that all the Syrian material formerly placed under this species is *G. syriaca*. The differential diagnosis given above is based on comparison with *Aucher-Eloy* 994 and the description on *G. P. Baker's* flowering specimen.

One matter remains for discussion—the status of the genus *Glycyrrhisopsis*. This was originally separated from *Glycyrrhiza* on the following characters: yellow petals, calyx not gibbous at the base, the wings very obtuse (not "acutate") straight (not curved) free (not adnate to the keel), ovary 2-ovulate (not 4- or 5-), legume much larger subcompressed (not flat torulose) and dehiscent (not subindehiscent). The calyx character given is probably not of very high value, but the other characters may be considered of generic value, as genera are usually recognized in this family.

Lythrum hispidulum (Dur.) Koehne in Sitzber. Bot. Ver. Brandenburg, 22, 22 (1880). *Peplis hispidula* Dur. in Duchartre, Rev. Bot. 2, 431 (1846-47).

W. THRACE : near Himitli, 60 m., 1.6.36, low damp places in grassland (now drying up), *H. G. Tedd* 1743.

This species was described from Algeria, "les flaques de la plaine d'Oran où il fleurit en avril et mai, après l'entière évaporation de l'eau." It has also been recorded from S. France : Hérault : Montpellier : mares de Roquehaute près d'Agde [Rouy et Fouc. Flor. Fr. 7, 166 : 1901, as *Lythrum Loiseleurii* Rouy et Cam. subsp. *hispidulum* (Dur.) Rouy et Cam.] and from Morocco : occiden. septent. ; Grand Atlas (Jahandiez et Maire, Catal. Pl. Maroc. 2, 513 : 1932) as *Lythrum nummularifolium* Lois. var *hispidulum* (Dur.) Maire. Rouy and Camus also give under "Aire géogre." Portugal, Spain, and Egypt, but without references to specimens or exact localities. Koehne (in Engler Pflanzenr. IV. 216, 64 : 1903) records "Provinz Algarve in Portugal," as well as Algeria and Montpellier for the species [as *Lythrum hispidulum* (Dur.) Koehne] and says "schwerlich in Ägypten."

L. hispidulum with *L. biflorum* (Salzm.) J. Gay form the section *Middendorfia* of the genus *Lythrum*. This section forms a link between *Lythrum* and *Peplis* and both species have been placed by different authors in *Lythrum* or in *Peplis*. *Middendorfia* Trautv. and *Lythropsis* Welw. are generic names which have been used with specific epithets for one or other of the two known species of the section. The synonymy is given in the references quoted above.

Tedd's material (No. 1743) is ample and agrees so well with Durieu's original description and with Algerian material at Kew that there is no doubt of its correct identification. Further *Lythrum hispidulum* (Dur.) Koehne seems to be quite a distinct species and not merely a variation of *L. biflorum* as some authors have considered it. The campanulate-tubulose "calyx-tube," the minute "appendices," and the rounded leaf bases, as well as other characters are definite and constantly associated in the material examined. Neither the plant nor its flowers are conspicuous and it has probably been overlooked in many localities. At present its known distribution is discontinuous but it may well occur in various intermediate stations.

The essential synonymy of *Lythrum biflorum* (Salzm.) is : *Peplis biflora* Salzm. ex DC. Prodr. 3, 77 (1828) et Schultes Systema, 7, 54 (1829). *Lythrum nummulariaefolium* Loisel. in Desv. Journ. de bot. 2, 330 (1809) non Pers. (1807). *Peplis erecta* Req. in Benth. Cat. Pyr. 111 (1826) nomen nudum. *Lythrum biflorum* J. Gay in Ann. Sci. Nat. 26, 227 (1832).

Vinca difformis Pourr. in Mém. Acad. Toul. 3, 333 (1788).

Collected in Syria, west of Antioch, by G. P. Baker, April 1936.

This species is not recorded in Post, Flora of Syria, Palestine, and Sinai 2, 186-7 (ed. 2, by J. E. Dinsmore, 1933) or in Bouloumoy, Flore du Liban et de la Syrie, 225 (1930). It has mainly a Western Mediterranean Basin distribution being recorded from : Portugal, Spain, Balearics, S. France, Corsica, Sardinia, Italy, Algeria, and

Morocco. References and a description are given in Rouy, Flore de France 10, 226 (1908).

Salvia Teddii Turrill, sp. nov. a *S. Bertolonii* Vis. caulibus superne vix viscidis, verticillastris dense aggregatis recedit.

Herba perennis, ad 4 dm. usque alta. *Caules* erecti vel leviter nutantes, haud ramosi (inflorescentia excepta) pro parte majore haud foliosi, basi dense longeque hirsuti, in parte media et superiore pilis brevibus patulis vel leviter recurvis eglandulosis praediti, glandulis sessilibus vel breviter stipitatis perpaucis interspersis. *Folia* omnia basilaria vel duo usque ad 4 cm. supra basem posita, lamina ovata oblongo-ovata vel oblonga usque ad 10.5 cm. longa et 6.8 cm. lata apice acuta vel obtusa basi plus minusve truncata vel cordata margine breviter lobata vel grosse dentata lobis vel dentibus irregulariter crenato-dentatis costa et nervis lateralibus 10–15 conspicuis pagina superiora glabra vel fere glabra minute bullata pagina inferiore dense hispidulis costa et nervis secundariis in parte inferiore hirsutis; petioli in foliis rosulatis 2–7 cm. longi, valde hirsuti. *Inflorescentia* omnino vel in parte superiore verticillastris dense aggregatis instructa, 7.5–12 cm. longa, inferne leviter et breviter ramosa ramis 1.5–3 cm. longis; bractae patulae, late ovatae, longe acuminatae, circiter 1.2 cm. longae et 7 mm. latae, extra albo-pubescentes et glandulosae, intus minute glandulosae. *Calyx* tubuloso-campanulatus, 9 mm. longus, purpurascens, dense glandulosus, labio superiori curvato-adscendente semi-elliptico 5 mm. longo 5 mm. lato apice breviter tridentato dentibus erectis vix divergentibus lateralibus leviter longioribus circiter 0.5 mm. longis fere spinulosis, labio inferiori 6 mm. longo bilobato lobis lanceolatis apice spinulosis 5 mm. longis 2–2.5 mm. latis trinerviis. *Corolla* 1.2–1.5 cm. longa, tubo 6–8 mm. longo superne leviter ampliato, labio superiore parum curvato 6–7 mm. longo disperso-glanduloso dorso piloso, labio inferiore profunde trilobato 6 mm. longo lobis lateralibus multo minoribus. *Stamina* glabra, filamentis apice barbulato excepto, connectivo 6 mm. longo, filamentis 3 mm. longo, antheris lobo fertili dehiscente 3 mm. longo, sterili 2.5 mm. longo; staminodia 1 mm. longa. *Stylus* 2 cm. longus.

W. THRACE: Karpouz Tepé, 930–1300 m., 24.5.36, on rocky slopes of limestone ridge, also in grassy hollows and basin, H.G. Tedd 1733.

Flowers dark blue purple.

Salvia Teddii is most noteworthy for the dense inflorescence. The upper whorls are close together and even the lower branches of the whole inflorescence are short and generally not very remote. In general appearance the inflorescence superficially recalls that of *S. nutans* L., but the calyx of this species is quite distinct.

The leaves in the 4 specimens of *S. Teddii* at Kew are grouped at or near the base of the stem, all forming a definite rosette or one pair situated a short distance up the stem. They show a fair range in size as indicated by the following measurements of the lamina

additional to the maximum measurements given in the description above: 5.5×3.5 cm., 7.5×3.5 cm., 8.0×2.5 cm., 9.0×4.5 cm., 10.5×6.0 cm., 10.0×7.0 cm. A pair of leaves situated above the middle of the stem is in shape and texture more or less intermediate between a pair of foliage leaves and a pair of bracts. These leaves may or may not subtend an inflorescence branch.

S. Bertolonii Vis. with which our species is compared was described by Visiani (Flor. Dalm. 2, 189: 1847) from material collected "in pascuis locisque herbidis circa Sebenico, Darnis, et probabiliter in reliqua Dalmatia." It is now recorded from Montenegro, Hercegovina, Dalmatia, S. Croatia, and Istria. The degree of glandulosity of the upper parts of the stems varies considerably.

Another species which, *e descriptione*, must be morphologically related to *S. Teddii* is *S. similata* Hausskn., in Mitt, Thür. Bot. Ver. N.F. 11, 36 (1897), with the habitat given as "in schistosis reg. med. Pindi supra Klinovo." The elongated slender stems, the inflorescence with remote whorls, and other small characters appear to be distinctive.

Ornithogalum alatum Turrill, sp. nov. a *O. Wiedemanni* Boiss. caulibus altioribus, bracteis haud deflexis, floribus majoribus differt.

Bulbus ovatus, 2–3 cm. altus, 1.5–2.5 cm. diametro. *Caules* 2.0–3.7 dm. alti, glabri. *Folia* 2–3, anguste linearia, apicem basinque versus gradatim angustata, 2.2–3.3 dm. longa vel longiora, usque ad 4 mm. lata, glabra. *Racemus* subcorymbosus, 10–16-florus, 7–13 cm. longus; pedicelli inferiores usque ad 9 cm. longi, medii et superiores gradatim breviores, erecto-patuli; bractee lineari-lanceolatae, acuminatae, inferiores 3–4.8 cm. longae, superiores 1.5–2.5 cm. longae, plus minusve membranaceae. *Perigonium* 1.3–2.7 cm. longum, tepalis exterioribus oblanceolatis apice minute apiculatis et minute papillois 6 mm. latis fascia viride 3.5 mm. lata notatis, interioribus oblongo-oblanceolatis apice rotundatis minute papillois haud minute apiculatis fere 6 mm. latis fascia viride 1.5–2.5 mm. lata plus minusve notatis. *Filamenta* anguste lanceolata, superne attenuata, 7 mm. longa; antherae dehiscentes angustissime oblongae, 2.5–3 mm. longae. *Ovarium* obovoideum, 7 mm. altum, 5.3 mm. diametro, insigniter alatum. *Stylus* 2 mm. longus.

W. THRACE: Karpouz Tepé, 770 m., 24.5.36, grassy slopes, rocks, and among bushes, *H. G. Tedd* 1741.

O. alatum is a species which appears to be placed best with a small group of plants having more or less well-marked wings to the ovaries and capsules. The species of this small group are described by Boissier, in Flor. Or. 5, 220–222 (1884), and amongst them is included as a new species *O. Wiedemanni* (l.c. 221). This species was first found by Wiedemann in northern Anatolia at Safranbol and in mt. Aladagh Szeben. It has since been recorded from E. Thrace Aznavour in Bull. Soc. Bot. France 46, 149: 1899 and Davidoff in Balg, Akad, Nauk. 12, 119: 1915) and from Bulgaria (Stojanov und Stefanoff in Oesterr. Bot. Zeitschr. 70, 296; 1921 and Jordanoff

in Trud. Balg. Prip. Druz. 11, p. 2 of separate: 1924). Unfortunately no material of the species has been found at Kew and comparison has had to be made with descriptions only.

As with many of the corymbose or subcorymbose *Ornithogala* the pedicels of *O. alatum* lengthen with age, this being particularly true of the lower ones. There is also an increase in size of the petals after anthesis. The wings on the ovaries are well marked and contain many cells partly filled with a bundle of narrow "needle" crystals (raphides). The oldest ovary (or young fruit) present in the type material is 1.1 cm. long and 8 mm. in diameter with the wings 2.5 mm. wide.

***Paspalum distichum* L.** Syst. Nat. ed. 10, 2, 855 (1759) et Amoen. Acad. 5, 391 (1759).

Specimens of an interesting grass have been received, from Dr. R. C. Shannon of the Rockefeller Institute, from Greek Macedonia. The grass has proved to be *Paspalum distichum* L., a species which, so far as is known, is new to the Balkan Peninsula. In reply to a request for the exact locality Dr. Shannon writes: "I found it growing abundantly in two streams in the Lahanas Hills area in Macedonia, Greece, and less so in other, smaller, streams of the same region. Also I am sure the same species grew abundantly in a borrow pit in the Strymon (Struma) valley, Chimaros Stream, on the east slope of the Hills." In an earlier communication Dr. Shannon explained that the grass was of considerable importance from the standpoint of anopheline mosquito breeding, as a certain species definitely prefers to oviposit in beds of this grass.

Paspalum distichum L. has been frequently confused with *P. vaginatum* Sw. It occurs over a wide area in ditches, streams and wet places in warm and warm-temperate regions in N., Central and S. America, Hawaiian Islands, France, Italy, Transcaucasia, S. Africa, India, China, Formosa, Indo-China, Australia, and New Zealand. A full account of the species is given by Chase in Contrib. U.S. Nat. Herb. 28, part 1, 46 (1929). Reference should also be made to Stapf in Flor. Trop. Afr. 9, 572 (1919).

***Abies Borisii-regis* Mattf.**

The problems connected with the firs of the Balkan Peninsula are fairly well understood but not solved. Briefly, *A. cephalonica* Loud. occurs in Greece proper (i.e. south of Epirus and Thessaly), *A. alba* Mill. in the northern and north-central parts, while in a broad belt between, including Thessaly, southern Albania, the extreme south of N. Macedonia, S. Macedonia, Athos, western Thrace, and the Rodope Massif, there occur plants showing various combinations of characters which to the south and to the north are so constantly associated as to be used as reliable specific characters. This very polymorphic population has been named *Abies Borisii-regis* by Mattfeld, who has very carefully and fully described its character combinations in a series of papers of which the longest

is in Bibliotheca Botanica, Heft 100 (1930). The history and origin of this population remains, however, in doubt. Mattfeld accepts a hybrid origin and says "dieser ganze Formenkomplex muss hybridogenen Ursprung haben: *Abies Borisii regis* ist ein populus hybridogenus" (l.c. 81). An alternative hypothesis, that the polymorphic population represents an original population from which *A. alba* has differentiated northwards and *A. cephalonica* southwards is also discussed, but rejected, by Mattfeld (l.c. pp. 82-83). The evidence at present available makes it impossible to decide between these (and other possible) hypotheses.

Dr. E. Anderson suggested to me that an examination of pollen-grains might be of some use in solving the problem. Natural hybrids are less common in the Coniferae than in some groups of Angiosperms and when they have been recorded the percentage of "bad" pollen is generally high.

Four specimens yielding pollen of *Abies Borisii-regis*, to retain the name without commitment to any theory as to the origin or taxonomic values of the plants involved, have been obtained recently. In all of these the pollen was overwhelmingly "good," i.e. there were no or at most 2-3 % of shrunken and collapsed grains. The specimens whose pollen was examined under the compound microscope were:

(1) *Tedd*, No. 1720, Thrace: Karpouz Tepé, 930m., 24.5.36, northern slopes of limestone mass. Only one tree here, with one sapling and two seedlings close by. Among beech, *Ostrya carpinifolia*, and *Carpinus*. No cones to be seen on tree or on ground. About 25 ft. high only. Seems to be the survivor of a former forest.

The shoots are hairy, the bud-scales of the opened buds slightly resiniferous, the leaf apices vary from acute or slightly apiculate to obtuse or rounded, they are not or very rarely, and then only slightly, emarginate, leaves 1.1-2.0 cm. long.

(2) *Hill*, *Sandwith*, and *Turrill*, No. 2312, Athos Peninsula: high above Simopetra on the way to Karyes, 700 m., 13.4.34, in open wood dominated by firs.

The shoots are glabrous, the bud-scales strongly resiniferous, the leaves on the flowering branches with apices obtuse or truncate, on the older branches acute, 1.5-2.0 cm. long.

(3) *Stefanoff*, s.n. Bulgaria: Rodope, recd. 8.36.

The shoots are hairy, the bud-scales scarcely resiniferous, and the leaf apices acute to obtuse and sometimes emarginate, leaves 0.8-1.8 cm. long.

(4) *Stefanoff*, s.n., Bulgaria: Rodope, recd. 8.36.

The shoots are hairy, the bud-scales scarcely resiniferous, the leaf apices acute to obtuse and sometimes emarginate, leaves 0.9-2.0 cm. long.

The evidence from the pollen examined is therefore not in favour of an interspecific hybrid nature of the four plants, unless there is also allopolyploidy. That the pollen is almost entirely "good"

does not, of course, mean that there has been no hybridization in the past history of the population of which the 4 plants are a very small random sample. Cytological data would be very welcome and any indications of allopolyploidy should be sought. K. and H. J. Sax (Journ. Arn. Arboretum 14, 359 : 1933) give 12 as the haploid chromosome number for *Abies cephalonica* and (l.c. 367) note that it has, in their material, 10% pollen sterility. They further (l.c. 369) remark that "polyploidy is rare in the Conifers" and that "the three polyploid species of Conifers described are presumably autopolyploids."

XII—NOTE ON A SPECIES OF NEORAUTANENIA. E. P. PHILLIPS.

In the Transvaal many species of plants which grow only a foot or more above the ground have a deep underground root or stem system. As examples may be quoted *Elephantorrhiza elephantina* (Burch.) Skeels, *Pachystigma pygmaeum* (Schltr.) Robyns, *Dichapetalum cymosum* (Hook.) Engl., though a long list of similar plants could be drawn up. The well-developed underground portion of the plant greatly exceeds the aerial portion and enables such plants to send out leaves and flowers even in periods of the severest droughts. They are quite independent of the first spring rains and in parts of the Transvaal, for example, the veld may be green, due to the thousands of plants of *Elephantorrhiza elephantina* in leaf, long before the rains have fallen.

Mr. J. W. Rowland of the Division of Plant Industry, collected a specimen of *Neorautanenia*, probably *N. edulis* C.A.Sm. (Nat. Herb. No. 20385),* at the junction of the Crocodile and Marico Rivers in the western Transvaal, though the plant also occurs plentifully in sandy loam veld of the northern Transvaal.

From the accompanying photograph some idea may be obtained of the enormous size of the underground portion. The length from the point where the main root is broken off to the point where the shoots are given off, is almost one metre. The circumference is 1.62 metres and the total weight of the plant 52 kilogrammes.

* The specimen forwarded by Dr. E. P. Phillips (Nat. Herb. 20385) has been compared with the type of *Neorautanenia Lugardi* (N.E. Br.) C. A. Smith, and agrees with it in every respect with the exception of the leaf-shape. The leaves of *N. Lugardi* are subrhomboid-obovate, with the two lowest lateral nerves strongly developed, reaching to the widest part of the leaf, whilst in the plant here figured the leaves are obovate-elliptic, and the two lowest lateral nerves are not so strongly developed. It is probable that *N. edulis* C. A. Smith & *N. Lugardi* are conspecific. They are separated in the Flora of the Transvaal on account of the supposed erect habit of the former, a character which is not supported by the collector's notes on the specimen at Kew.—E. Milne-Redhead.



Neorautanenia edulis, showing large underground portion.

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XIII—CONTRIBUTIONS TO THE FLORA OF SIAM.
ADDITAMENTUM. XLIII.

Carissa laotica *Pitard* var. **ferruginea** *Kerr* var. nov.; a typo foliis subtus sat dense ferrugineo-pubescentibus differt.

Saraburi, Muak Lek, c. 200 m., evergreen forest, *Kerr* 9118.

Except in the point noted the foliage of this plant agrees very closely with that of the type, as do the stout decurved spines. The only collection is in fruit; the fruit being globular, about 2 cm. in diameter, as far as can be judged from the dried and flattened material.

Ervatamia calcicola *Kerr* (Apocynaceae-Plumerieae); *E. hirtae* Hk. f. affinis, foliis pubescentibus pedunculis brevioribus inter alia differt.

Frutex c. 3 m. altus, ramulis hornotinis subquadratis laevibus glabris, mox teretibus valde corrugatis. *Folia* late elliptica vel ovato-elliptica, apice breviter acuteque acuminata, basi late cuneata, interdum parum inaequilateralia, usque ad 12.5 cm. longa, 5.5 cm. lata, membranacea, supra olivacea sparse breviter pubescentia, subtus pallidiora copiose molliter pubescentia, costa supra leviter impressa subtus prominente, nervis lateralibus utrinque 12–18, patulis subparallelis, supra conspicuis subtus prominentibus, rete venularum supra subtusque subconspicuo; petiolus 6–9 mm. longus, minute pubescens, supra concavus, basi ligula 1.5 mm. longa praeditus. *Inflorescentia* terminalis vel axillaris, cymosa late ramosa usque ad 5 cm. longa, 5 cm. lata, pedunculo communi crasso 0.7–1.5 cm. longo, ut pedunculis partialibus pedicellisque sparse pubescente; bracteae minutae cito deciduae; pedicelli 5–8 mm. longi. *Calyx* 5-partitus, extra minute pubescens, intus eglandulosus; tubus c. 0.5 mm. longi; lobi deltoidei, subacuti, 1.5 mm. longi. *Corollae* tubus extra intusque glaber, 10–11 mm. longus, superne parum inflatus; lobi obovati, apice rotundati, 10 mm. longi, 5 mm. lati, extus parte in alabastro detecta minute pubescentes ceterum glabri. *Stamina* 7 mm. supra basin tubi inserta, antheris 2.5 mm. longis, breviter mucronatis, thecis externis basi parum incurvis, filamentis 0.25 mm. longis. *Carpella* 0.5 mm. alta, apice rotundata; stylus 5 mm. longus; stigma cylindraceum papillosum, stylo multo crassius, apice longius biapiculatum. *Folliculi* velutini recurvati, sessiles, apice breviter rostrati, haud carinati, c. 2 cm. longi, seminis 3–5.

Loi, Wang Sapung, c. 300 m., on rocky limestone hill, *Kerr* 8620B (*type*, flowers); Udawn, Nawng Bua, c. 300 m., among limestone rocks, *Kerr* 8620A (fruits).

Ervatamia celastroides *Kerr* (Apocynaceae-Plumerieae); species *E. malaccensi* (Hook. f.) King et Gamble affinis, a qua pedunculo multo brevior, calycis lobis brevioribus inter alia differt.

Frutex 1–1.5 m. altus, omnino glaber, ramulis striatis. *Folia* interdum imparia, elliptica vel lanceolata, apice longe obtuseque

acuminata, basi cuneata, 4.5–12 cm. longa, 1.5–4.3 cm. lata, subcoriacea, sicco fusco-olivacea subtus multo pallidiora, costa supra parum prominula, subtus prominente, nervis lateralibus utrinque 8–12, cum nervulis supra subtusque inconspicuis, petiolo 2–3 mm. longo suffulta. *Cymae* axillares, 8–15-florae, pedunculis subnullis vel usque ad 5 mm. longis suffultae; bracteae lineares vix 1 mm. longae, cito deciduae; pedicelli 2–6 mm. longi; alabastra apice conica. *Calyx* 5-partitus, tubo c. 0.5 mm. alto, lobis triangularibus obtusis vel subacutis, costam secus incrassatis, margine tenuibus haud ciliatis, intus ad basin glandulosus, 2 mm. longis. *Corollae* tubus 11–12 mm. longus, extra intusque glaber, dimidio superiore leviter inflatus; lobi obovati parum falcati, apice rotundati, 12 mm. longi, 7 mm. lati. *Stamina* 6–7 mm. supra basin tubi inserta; filamenta glabra 0.5 mm. longa; antherae 3 mm. longae, breviter mucronatae, thecis externis fere rectis. *Ovarium* c. 1 mm. altum, apice rotundatum; stylus c. 5.5 mm. longus; stigma c. 1 mm. longum, longe apiculatum, ut videtur apiculo integro. *Folliculi* oblongi, plus minusve recurvi, 2.5–3.5 cm. longi, 8 mm. diametro, haud stipitati, leviter 3-costati, apice rostrati, rostro spiniformi c. 8 mm. longo; semina 5–7, subtrigona, c. 8 mm. longa, hilo alte 3-sulcata.

Nakawn Sawan, Me Wong, c. 200 m., in evergreen forest, *Kerr* 6035 (*type*); Prachuap, Hui Yang, *Put* 3240.

The description of the fruit and seeds has been drawn up from *Put* 3240.

***Ervatamia ceratocarpa* Kerr** (Apocynaceae-Plumerieae); species ab *E. celastroide* Kerr foliis atque floribus majoribus distincta.

Frutex c. 1.5 m. altus, omnino glaber. *Folia* anguste elliptica vel elliptico-lanceolata, apice sensim obtuseque acuminata, basi cuneata, 8–17 cm. longa, 1.2–5 cm. lata, chartacea, sicco supra olivacea subtus pallidiora, costa supra impressa subtus prominente, nervis lateralibus utrinque 10–13, subtus prominulis, nervulis inconspicuis; petiolus 2–6 mm. longus, supra valde sulcatus. *Inflorescentia* saepius axillaris, interdum terminalis, cymosa 2–5-flora, rarius 1-flora; pedunculus subnullus vel usque ad 12 mm. longus; bracteae ovatae 1–1.5 mm. longae; pedicelli 7–11 mm. longi; alabaster apice obtuse conicus. *Calyx* 5-partitus; tubus subnullus; lobi ovati, subacuti, glabri, intus ad basin glandulosi, 2 mm. longi. *Corollae* tubus 13 mm. longus, medio leviter inflatus, extra glaber, intus infra stamina pilis paucis instructus; lobi leviter falcati, apice rotundati, 15 mm. longi, 5 mm. lati. *Stamina* 6 mm. supra basin inserta; antherae 2.5 mm. longae, breviter mucronatae, thecis externis fere rectis; filamenta 0.5 mm. longa. *Carpella* 0.7 mm. alta, apice rotundata; stylus 4 mm. longus; stigma cylindraceum papillosum, apice longe apiculatum, apiculo bifido. *Folliculus* ut videtur saepius unicus, usque ad 5 cm. longus, basi haud stipitatus, apice curvo-rostratus, rostro ad 18 mm. longo; semina 2–5.

Krat, Kao Kuap, c. 100 m., in evergreen forest, *Kerr* 17692 (type), *Put* 2948.

The fruit has been described from *Put* 2948.

***Parsonsia siamensis* Kerr** (Apocynaceae-Parsonsieae); species *P. Helicandrae* Hook. et Arn. habitu similis, a qua staminum filamentis brevioribus, haud contortis, calycis lobis rotundatis, inter alia distinguenda.

Caules scandentes, graciles, teretes, minute pubescentes, leviter striati. *Folia* oblongo-ovata vel oblongo-elliptica, apice breviter acuteque acuminata, basi cuneata vel rotundata, margine integra, 8–12.5 cm. longa, 2.5–5 cm. lata, chartacea, sicco supra olivacea, infra pallidiora, subtus ad costam sparse minuteque setulosa, ceterum glabra, nervis lateralibus utrinque 5–7, sensim arcuatis, supra leviter impressis, subtus prominulis; petiolus 1–1.6 cm. longus, supra convexus, minute pubescens, basi glandulis papillois praeditus. *Panicula* terminalis vel axillaris, usque ad 20 cm. longa, pedunculo 3.5–9 cm. longo incluso, omnino minute pubescens, bracteis ovatis acutis 1–2 mm. longis. *Calycis* lobi rotundati, minute pubescentes, ciliati, 2 mm. longi, intus basi cujusque lobi squama unica, vel gemina, membranacea deltoidea praediti. *Corollae* tubus 4 mm. longus, extra intusque glaber; lobi dextrorsum obtegentes, 3 mm. longi, 1 mm. lati, apice obtusi, extra sparse setulosi, intus glabri. *Staminum* filamenta 0.5 mm. supra basin tubi inserta, inter se libera, villosa, c. 1 mm. longa; antherae semiexsertae, 3.5 mm. longae, apice acutae, basi in appendiculas obtusas divergentes productae. *Disci* squamellae 5, discretae, carnosae, apice rotundatae, 0.75 mm. altae. *Carpella* connata glabra, 1.5 mm. alta; stylus gracilis, 2 mm. longus; stigma cylindraceum, c. 1 mm. longum, basi membrana cupuliformi reflexa cinctum. *Fructus* immaturus solum visus, 10 cm. longus, carpellis cohaerentibus, apice sensim attenuatus.

Pang-nga, Kao Katakam, c. 400 m., climbing in evergreen forest, *Kerr* 18496.

***Wrightia lanceolata* Kerr** (Apocynaceae-Parsonsieae); a *W. coccinea* Sims floribus minoribus petalis pro rata angustioribus inter alia distinguenda.

Frutex c. 2 m. alta, ramulis juventute compressis puberulis. *Folia* lanceolata, apice sensim attenuata acuta, basi late cuneata vel subrotundata, 6–9 cm. longa, 2–2.8 cm. lata, chartacea, supra parce minuteque puberula, subtus pubescentia, costa supra leviter impressa subtus prominente, nervis lateralibus utrinque 12–16, supra inconspicuis subtus prominentibus, subparallelis, prope marginem arcuatis, rete nervarum supra obscuro subtus prominulo; petiolus c. 2 mm. longus, supra concavus, minute puberulus, basi glandulis 2–3 papilliformibus instructus. *Inflorescentia* 1–3-flora, subterminalis, sessilis, bracteis minutis, pedicellis 4–6 mm. longis, cum calyce minute puberulis. *Calycis* lobi ovati subacuti ciliati, 2 mm. longi, intus basi squamis 5 membranaceis subquadratis apice sinuatis,

c. 1 mm. altis, 1 mm. latis, instructi. *Corolla* hypocrateriformis, rubra; tubus 2.5 mm. longus, intus glaber, extra prope apicem minute papillosus; lobi oblongo-elliptici, 16 mm. longi, 8 mm. lati, omnino minute papilloso; coronae segmenta bina, inaequaliter bifida, circa 2 mm. longa, paulo supra basin cujusque lobi inserta. *Stamina* ad apicem tubi affixa, filamentis glabris 1 mm. longis; antherae exsertae anguste sagittatae 7 mm. longae, dorso dimidio superiore densae pilosae. *Carpella* connata 1.75 mm. alta; stylus 5 mm. longus; stigma c. 2 mm. longum. *Fructus* carpellis cohaerentibus, c. 15 cm. longus, striatus; semina 10–11 mm. longa, apice obtusa, basi coma albida ornata.

Prachuap, Sam Roi Yawt, c. 50 m., on rocky limestone hill, *Kerr* 10926 (*type*, flower), *Put* 2514 (fruit).

Wrightia viridiflora *Kerr* (Apocynaceae-Parsonsieae); affinis *W. laevi* Hook. f., a qua floribus minoribus, filamentis coronae pro rata brevioribus inter alia differt.

Frutex vel *arbuscula* ramulis juventute leviter compressis sparse pubescentibus. *Folia* late elliptica vel ovata, apice breviter obtuseque acuminata, basi late cuneata vel rotundata, 3.5–10 cm. longa, 2–4.8 cm. lata, membranacea, supra glabra, subtus sparse pubescentia, nervis lateralibus utrinque c. 7, cum costa supra parum impressis subtus prominentibus; petiolus 3–4 mm. longus, breviter pubescens. *Inflorescentia* ut videtur terminalis, 3–6-flora, usque ad 1.5 cm. longa, breviter puberula, pedunculo communi subnullo, ramis 1.5–2 mm. longis, pedicellis gracilibus 6–8 mm. longis, bracteis ovatis circa 1 mm. longis. *Calyx* lobis late deltoideis, 1.5 mm. longis, intus squamis 5 lobatis membranaceis instructus. *Corolla* pallide viridis; tubus 1.5–2 mm. longus, extra intusque glaber; lobi oblongi apice rotundati, ciliati, 5 mm. longi, 3 mm. lati, alabastro sinistrorsum obtegentes; coronae filamenta 2-seriata, serie altera parum supra basin lobi inserta, altera ad sinum inter lobos affixa, usque ad 2 mm. longa. *Stamina* ad apicem tubi affixa, filamentis crassis glabris, 0.5 mm. longis; antherae exsertae, anguste sagittatae, 3 mm. longae, loculis basi in appendiculas breves incurvas productis, connectivis dorso glabris, ventre parce pilosis. *Carpella* libera glabra 1 mm. alta, stylo cum stigmate 2.25 mm. longo. *Fructus* ignotus.

Saraburi, Muak Lek, *Put* 3086.

Strophanthus siamensis *Kerr* (Apocynaceae-Euechitideae); affinis *S. perakensi* Scortechini, a quo corollae lobis brevioribus, calycis lobis haud acuminati differt.

Frutex scandens, inflorescentia excepta glaber; ramuli teretes, lenticellis pallidis subrotundatis prominulis copiose obsiti. *Folia* oblongo-elliptica vel oblongo-oblancoolata, apice breviter obtuseque acuminata, basi cuneata, usque ad 10 cm. longa, 3.2 cm. lata, chartacea, supra nitidula statu sicco viridi-brunnea, subtus opaca multo pallidiora, costa supra impressa, subtus prominente, nervis lateralibus

utrinque 12–15 inconspicuis, fere rectis vel leviter arcuatis, angulo 85°–90° a costa orientibus; petiolus c. 2 mm. longus, supra alte canaliculatus, basi 1–2 glandulis papilliformibus munitus. *Inflor-escentia* terminalis, cymosa, 3–8-flora, 4–6.5 cm. longa, pedunculo 2–3 cm. longo incluso, pedunculis, bracteis et pedicellis minute puberulis; bractee oppositae secus pedunculos secundarios distanter dispositae, ovatae acutae 1.5–3 mm. longae; pedicelli 1.5–2 mm. longi. *Calyx* 5-partitus, extra minute puberulus, lobis ovatis sub-acutis 3 mm. longis, intus basi glandulis 5–6 parvis praeditus. *Corollae* tubus inferne cylindricus, superne infundibuliformis, 6.5 mm. longus, extra glaber, intus callis 5 guttiformibus, infra staminum insertionem dispositis, puberulis instructus, ceterum glaber, fauce squamis quinque, 0.75 mm. altis, late bifurcatis, praeditus. *Stamina* 4 mm. supra basin tubi inserta; filamenta 0.5 mm. longa, exigue pilosa; antherae 1.5 mm. longae, connectivo retrorsum piloso superne in appendicem filiformem pilosam 3.5 mm. longam producto. *Carpella* 1 mm. alta, apice rotundata, breviter pilosa; stylus glaber 4 mm. longus, infra stigma leviter dilatatus; stigma cylindricum, apice apiculatum, 1 mm. longum. *Fructus* ignotus.

Sriracha, evergreen forest, c. 100 m., *Kerr* 4173.

***Ichnocarpus fulvus* Kerr** (Apocynaceae-Euechitideae); species corollae lobis brevibus, in alabastro haud deflexis, distincta.

Frutex scandens, dense fulvo-tomentosus. *Folia* elliptica vel lanceolata, leviter acuminata, basi rotundata, apice acuta, chartacea, 3.5–6.5 cm. longa, 1–2.6 cm. lata, sicco supra viridi-brunnea subtus fulva, subtus ad costam nervosque dense fulvo-tomentosa ceterum pilis mollis obsessa, punctata, supra pilis sparsius instructa, costa ut nervis supra impressa, subtus prominula, nervis lateralibus utrinque 5–7, angulo 45° a costa ascendentibus, prope marginem arcuatis; petiolus 2–3 mm. longus, crassus, dense fulvo-tomentosus. *Inflor-escentia* terminalis, conferta, 1–2 cm. longa, pedunculo 5–7 mm. longo, ut pedunculis secundariis bracteisque fulvo-tomentoso, pedunculis secundariis c. 2 mm. longis, bracteis ovatis 2–3 mm. longis, pedicellis brevissimis. *Calycis* lobi oblongi, obtusi, 2.5 mm. longi, extra tomentosi, intus glabri basi glandulis minutissimis paucis praediti. *Corolla* flava (ex *Marcan*); tubus 3.5 mm. longus, medio inflatus, extra pubescens, intus pilis paucis ad partem inflatam exceptis glaber; lobi breviter obtuseque falcati, 1.5 mm. longi, 3 mm. lati. *Stamina* paulo infra medium tubi affixa, inclusa; antherae ovatae, breviter apiculatae, 1.25 mm. longae; filamenta brevissima. *Disci* lobi lineares, distincti, carpella superantes, 1 mm. alti. *Carpella* 0.5 mm. alta, apice pilosa. *Fructus* ignotus.

Sriracha, clearing on hillside, *Marcan* 1361.

In the shape and aestivation of its corolla lobes this species resembles *Parabarium* rather than *Ichnocarpus*, but the disc is that of *Ichnocarpus*.

Ichnocarpus uliginosus *Kerr* (Apocynaceae-Euechitideae); a speciebus ceteris inflorescentiis axillaribus paucifloris foliis multo brevioribus distinguenda.

Frutex scandens ramosus, ramulis primo compressis minute puberulis, mox teretibus glabris. *Folia* anguste elliptica vel oblanceolata, apice acuta, minute mucronata, basi anguste cuneata, 4-5.5 cm. longa, 0.7-1.3 cm. lata, glabra, statu sicco supra subnitida, subtus pallidiora opaca, costa supra impressa, subtus prominente, nervis lateralibus utrinque 5-7, supra obscuris subtus prominulis, angulo 30° a costa ascendentibus, leviter arcuatis; petiolus c. 1.5 mm. longus, juventute pilis appressis, praesertim prope apicem, instructus. *Inflorescentia* vulgo axillaris, rarius terminalis, 2-6-flora; pedunculus 1-3 mm. longus, pilis appressis instructus; pedunculi secundarii brevissimi; bracteae deltoideae leviter puberulae vel fere glabrae, 1 mm. longae; pedicelli 0.5-1 mm. longi. *Calycis* lobi deltoidei subacuti, 1.5 mm. longi, glabri nisi ad apicem pilis paucis ornati, intus basi glandulis minutis paucis praediti. *Corolla* alba; tubus medio leviter inflatus, 3 mm. longus, extra intusque glaber; lobi patentes, falcati, apice acute acuminati, glabri, 5.5 mm. longi, 1 mm. lati. *Stamina* ad medium tubi affixa, inclusa; antherae 1 mm. longae, breviter mucronatae; filamenta 0.5 mm. longa, glabra. *Discus* anguste annularis, lobis linearibus 5, haud clavatis, 0.6 mm. longis, carpella leviter superantibus, munitus. *Carpella* 0.5 mm. alta, apice hirsuta, stigmatibus conico, cum stylo perbreve 1.3 mm. longo. *Folliculi* veteres, seminis delapsis, 10 cm. longi, pericarpio tenui striato glabro, haud stipitati apice longe attenuati. *Semina* haud visa.

Raheng, Kao Padang, c. 120 m., climbing on low bushes round marsh, *Kerr* 2979.

Aganosma breviloba *Kerr* (Apocynaceae-Euechitideae); ab affini *A. elegante* G. Don floribus majoribus tubo corollae pro rata longiore differt.

Frutex scandens, ramulis novellis sparse adpresse strigosis, mox glabris, cortice nigro-brunneo leviter striato obtectis. *Folia* elliptica vel obovata, apice abrupte breviter acuteque acuminata, basi acute cuneata, 5-9 cm. longa, 3-4.7 cm. lata, chartacea, glabra, sicco supra brunnea subtus pallidiora, costa supra impressa subtus prominente, nervis lateralibus utrinque 6-8, patentibus, leviter arcuatis, supra inconspicuis subtus prominulis, rete nervarum subtus subconspicuo; petiolus 7-10 mm. longus, supra alte convexus, glaber. *Inflorescentia* terminalis, ramosa, multiflora, usque ad 6 cm. longa et lata, ramulis puberulis, bracteis cito deciduis, pedicellis 4-8 mm. longis pubescentibus. *Calycis* lobi sub anthesin patentes, lineares, acuti, 11 mm. longi, 1.5 mm. lati, utraque pagina pubescentes, intus basi glandulis paucis obpyriformibus instructi. *Corolla* alba; tubus 11 mm. longus, infra medium sensim ampliatus, basi contractus, extra pubescens, intus superne dense pilosus; lobi ovati, subacuti, 5 mm. longi, 2.5 mm. lati, pagina utraque velutini.

Stamina infra medium tubi affixa, inclusa ; antherae anguste sagittatae, 5·5 mm. longae ; filamenta perbrevia, pilosa. *Discus* cupuliformis, carpella multo superans, apice 5-lobatus, 1·75 mm. altus. *Carpella* apice pilosa ; stigma 3 mm. longum, basi cupuliforme, apice apiculatum. *Fructus* non visus.

Doi Sutep, 750 m., evergreen forest, *Kerr* 3211.

***Aganosma montana* Kerr** (Apocynaceae-Euechitideae) ; species *A. radiatae* Merrill affinis, a qua foliis minoribus, corollae tubo pro rata brevior inter alia differt.

Frutex scandens ; ramuli primo adpresse hirsuti, cito glabrescentes, cortice nigrescente leviter rugoso lenticellis rotundatis sparse instructo oblecto. *Folia* elliptica vel oblonga, apice subito acute acuminata, basi cuneata, 7·5–10 cm. longa, 3–4·5 cm. lata, chartacea, olivacea, glabra, costa supra impressa, subtus prominula, nervis lateralibus utrinque 8–9, patulis, leviter arcuatis ; petiolus 1–1·5 cm. longus, primo adpresse hirsutus, cito glaber. *Inflorescentia* cymosa terminalis, 8–14-flora, puberula, usque ad 7 cm. longa, 9 cm. lata, breviter pedunculata ; bractae cito deciduae, oblongae, subacutae, 10 mm. longae, 4 mm. latae, puberulae ; pedicelli 9–10 mm. longi, pubescentes. *Calycis* lobi sub anthesin patentes, lanceolati, 12 mm. longi, 4 mm. lati, utraque pagina puberuli, basi glandulis obpyriformibus paucis praediti. *Corollae* tubus leviter sulcatus, infra medium parum dilatatus, basi contractus, 12 mm. longus, extra breviter tomentosus, intus dense villosus ; lobi alabastro leviter sinistrorsum torti, dextrorsum obtegentes, sub anthesin patentes, inaequaliter obovati, 14 mm. longi, 9 mm. lati, basi villosi. *Stamina* infra medium tubi inserta, inclusa, antheris anguste sagittatis, 6·5 mm. longis. *Discus* cupuliformis, apice parum inaequaliter tamen valde 5-lobatus, glaber, 1·75 mm. altus. *Carpella* glabra, discreta, 0·75 mm. alta ; stylus 2·5 mm. longus ; stigma 3·25 mm. longum, apice apiculatum. *Fructus* non visus.

Krat, Kao Kuap, *Put* 2868.

***Anodendron nervosum* Kerr** (Apocynaceae-Euechitideae) ; species *A. affini* (Hook. et Arn.) Druce accedens, foliis pro longitudine latioribus, nervis numerosis distinguenda.

Frutex scandens, floribus exceptis omnino glaber, ramulis juventute compressis mox teretibus, cortice crebre longitudinaliter sulcato statu sicco nigro-brunneo oblectis. *Folia* elliptica, oblonga, vel oblanceolata, apice breviter obtuseque acuminata, basi cuneata, 6·3–9·4 cm. longa, 2·7–3·6 cm. lata, chartacea, sicco supra olivacea subtus pallidiora, costa supra leviter impressa, subtus prominula, nervis lateralibus utrinque 18–25, angulo c. 70° a costa ascendentibus, fere rectis, prope marginem obscure anastomosantibus, supra obscuris, subtus conspicuis vix elevatis ; petiolus 10–15 mm. longus, supra leviter convexus. *Inflorescentia* terminalis paniculata, usque ad 15 cm. longa, 9 cm. lata, pedunculo communi ad 4·5 cm. longo ; bractae anguste triangulares, 1–1·5 mm. longae ; pedicelli

1.5-2.5 mm. longi. *Calyx* glaber, intus ad quemque sinum glandula parva praeditus, lobis subobtusis 1 mm. longis. *Corolla* hypocrateriformis pallide viridula; tubus 3.5 mm. longus, infra medium leviter ampliatus, basi constrictus, extra glaber intus villosus; lobi lineares, parum inaequilaterales, apice obtusi, 7 mm. longi, 1.75 mm. lati, supra velutini, subtus glabri. *Stamina* prope basin tubi inserta, inclusa; antherae sagittatae, apiculatae, 1.25 mm. longae. *Discus* breviter 5-lobatus, 0.25 mm. altus, carpella aequans. *Carpella* glabra; stigma basi cupuliforme, apice breviter apiculatum, cum stylo 1.25 mm. altum. *Folliculi* continui vel parum reflexi, crassiusculi teretes, e basi rotundata sensim attenuati, c. 10 cm. longi; semina compressa ovata, rostro excepto 18 mm. longa, 6 mm. lata, apice in rostrum gracile 15-30 mm. longum, coma alba e dimidio superiore oriente ornatum, producta.

Dan Sai, Pu Lom Lo, c. 1500 m., evergreen forest, *Kerr* 5784.

Anodendron sutepense *Kerr* (Apocynaceae-Euechitideae); affine *A. manubriato* (Wall.) Merrill, sed inflorescentia foliis brevior disco altius lobato differt.

Frutex scandens, floribus exceptis omnino glaber, ramulis novellis compressis longitudinaliter sulcatis. *Folia* saepius oblanceolata, apice breviter obtuseque acuminata, basi in petiolum sensim attenuata, 9-14.5 cm. longa, 3.6-5.5 cm. lata, tenuiter chartacea, statu sicco supra olivacea, subtus pallidiora, costa supra prominula vel leviter convexa, subtus prominente, nervis lateralibus utrinque 10-12, angulo c. 60° a costa ascendentibus, supra subtusque leviter prominulis, parum arcuatis; petiolus 1-1.8 cm. longus, supra convexus. *Inflorescentia* terminalis paniculata, usque ad 8 cm. longa, 8 cm. lata, pedunculo communi 0.5-2.5 cm. longo; bractee anguste ovatae, c. 1 mm. longae; pedicelli 1.5-2.5 mm. longi. *Corolla* hypocrateriformis, viridis; tubus 2 mm. longus, extra glaber, intus villosus; lobi oblongi, parum inaequilaterales, apice obtusi uno latere apiculati, margine oblecto minute eroso-ciliati. *Stamina* prope basin tubi inserta, inclusa, subsessilia, antheris sagittatis c. 1 mm. longis. *Discus* alte 5-lobatus, interdum lobis duobus connatis ceteris discretis, 0.5 mm. altus, carpella superans. *Carpella* glabra, stylo cum stigmate obpyriformi 0.75 mm. longo. *Fructus* ignotus.

Doi Sutep, 1650 m., evergreen forest, *Kerr* 1748.

XIV—NEW PLANTS FROM TIBET AND SIKKIM.

C. E. C. FISCHER AND H. FRÖDERSTRÖM.

In the course of an expedition into Tibet in August and September 1935, Messrs. C. S. Cutting and A. S. Vernay made a very interesting collection of nearly 200 specimens. Of these 9 have proved to be new species. Three of the new species had been found by previous collectors but had remained undescribed. In addition a *Corydalis*

is probably new but the material is insufficient to warrant publication. This applied with less confidence to several other specimens. Two new species of *Gentiana* will be published shortly by Mr. C. V. B. Marquand in "Hooker's Icones Plantarum."

Opportunity is taken to include a new species of *Sedum*, kindly described by Dr. H. Fröderström, which was collected during the 1924 Expedition to Mount Everest.

Clematis Vernayi C. E. C. Fischer, sp. nov. [Ranunculaceae]; a *C. acutangula* Hook. f. et T. caulibus haud acuto-angulatis, pinnis foliorum 1-3-jugatis, foliolis haud crenato-serratis haud acutis, sepalis majoribus intus pubescentibus recedit.

A climbing *bush*; stem terete, longitudinally ribbed, up to 3 mm. diam., pubescent, purple or purplish-brown. *Leaves* opposite, biternate, 4-12 cm. long; petiole (4-6 cm. long), rhachis and petioles (4-10 mm. long) pubescent; leaflets lanceolate and entire, or ovate and deeply 2-5-lobed, subacute or obtuse, base attenuate or rounded, 1.5-3 cm. long, 1-1.7 cm. wide, sparsely appressed-pubescent, usually 3-nerved from the base, nerves somewhat raised below, margins sometimes slightly toothed. *Flowers* solitary, axillary, often several on short axillary, leafy branchlets, 3.5-4.5 cm. diam.; pedicels 1.5-6 cm. long, terete, ribbed, pubescent, either bractless or with a pair of oblong or spatulate-oblong, shortly petioled bracts up to 1 cm. long, at or near the base. *Sepals* 4, rarely a smaller fifth added, corolline, yellow, elliptic to elliptic-ovate, subacute, 1.6-2.4 cm. long, 0.8-1.4 cm. wide, glabrous or with a few hairs without, densely grey-pubescent within. *Stamens* numerous; filaments linear, 1-ribbed, 4-4.5 mm. long, shortly silkily hairy; anthers oblong, 2-2.5 mm. long, glabrous. *Pistil* 1 cm. long densely silvery and silky; ovary very short, ellipsoid. *Achenes* not seen.

Tibet: 12 miles N.W. of Gyantse towards Shigatse, 13,000 ft., fls. Aug., C. S. Cutting and A. S. Vernay 57. "The only yellow-flowered *Clematis* seen, growing on side of road with *C. orientalis*."

Oxytropis sericopetala C. E. C. Fischer, sp. nov. [Papilionaceae]; *O. Thomsoni* Benth. ex Baker affinis, foliolis ellipticis, petalis dorso sericeis, legumine brevior elliptico-ovato recedit.

A tufted *herb*; rootstock woody, up to 20 cm. long, 5 mm. diam.; stems 2-4, up to 2 cm. long, more or less grey-woolly. *Leaves* 7-20 cm. long; petioles 2-9 cm. long, with the rhachis silvery or buff-tomentose; leaflets 10-15 pairs, sessile or subsessile, the lower larger and distant, more or less imbricate towards the smallest terminal one, elliptic, acute, 6-25 mm. long, 2-7 mm. wide, silvery- or buff-villous, nerves few, very obscure; stipules lanceolate, acuminate, 1-1.5 cm. long, silvery- or buff-villous. *Peduncles* axillary, 4-20 cm. long, stouter than the petioles, silvery- or buff-villous-tomentose. *Spike* dense throughout or a few of the lower flowers scattered and distant, 1.5-8 cm. long; bracts linear, acuminate, 2.5 mm. long, villous. *Flowers* sessile. *Calyx* silvery-villous without,

glabrous within; tube tubular, 3.5 mm. long; lobes linear-ensiform, 4.5–5 mm. long. *Corolla* much exserted, blue-purple, all the petals silky-villous on the back; standard obcordate, sinus very narrow, 10.5–11.5 mm. long, 6–7 mm. wide; wings oblong, apex rounded, with a lateral rounded lobe, 9.5 mm. long, 3.5 mm. wide, claw long, narrow; keel 7.8–8.5 mm. long, its petals cohering throughout, sharply beaked, the apex usually curved outwards, shaggy towards the apex; anthers small, muticous; ovary shortly stipitate, linear, 4 mm. long, villous; ovules 8; style subulate, upcurved, 3–3.3 mm. long, glabrous except at the base; stigma minute, capitate. *Pod* elliptic-ovate, compressed, densely silky, tipped with the style, 6.5 mm. long, 4 mm. wide. *Seed* solitary (always?) discoid, nearly filling the cavity.

Tibet: Shigatse, 12,800 ft., fls. and young frt. Sept., C. S. Cutting and A. S. Vernay 91 (type in Herb. Kew.), "common"; Lhasa, 11,500 ft., L. A. Waddell; Gyantse Hill, H. M. Stewart; Gyantse, Capt. H. J. Walton (the last 3 are without numbers).

Sir David Prain established the novelty of this species and proposed the appropriate name adopted. It should make a handsome rock-garden plant.

***Sedum petiolatum* H. Fröderström**, sp. nov. [Crassulaceae]; species gregis *Primuloides* fortasse *S. Karpelesae* Hamet proxima, differt autem ab omnibus speciebus hujus gregis: foliis longe petiolatis, inflorescentia corymbosa satis multiflora, sepalis angustioribus, petalis superne denticulatis et squamis stipitato-spathulatis. Itaque, meo sensu, species nova himalensis.

Planta perennis glabra, caules steriles non edens. *Caudex* crassus, brevis latusque. *Folia caudicis* squamiformia: aut longe triangulari linearia, acuminata, usque ad 17 mm. longa, aut late linearia, apice parum dilatata et obtusa, 6–7 mm. longa. *Caules floriferi* 3–4 cm. longi, simplices, erecti, graciles; eorum folia basalia longe angusteque petiolata (petiolo circiter 15 mm. longo), laminis reniformi-orbicularibus apice obtusissimis circiter 15 mm. longis; folia itaque in toto circiter 30 mm. longa. *Folia media* et *superiora* ignota. *Inflorescentia* dense vel laxe corymbosa; bracteae lineari-lanceolatae, circiter 4 mm. longae. *Flores* pro planta magni, anisopentameri. *Sepala* basi non producta, suboblongo-triangularia, apice acuminata, circiter 4 mm. longa. *Petala* fere libera, subovata, in parte superiore denticulata, apice satis longe mucronata, 6–7 mm. longa, alba. *Stamina* omnia 4.5–5 mm. longa, epipetala, 1 mm. supra basin inserta; antherae oblongae, subapiculatae. *Squamae nectariferae* longe lateque stipitatae, apice dilatatae et obtusae, crassae, in sicco fuscae, circiter 1×0.4 mm. *Carpella* immatura erecta, satis longistyla, subovata, circiter 4 mm. longa. *Semina* ignota.

Tibet: Rongshar valley, 13,000 ft., fls. Sept., Major R. W. G. Hingston 51 (Mt. Everest Expedition 1924).

Sedum sangpo-tibetanum H. Fröderström, sp. nov. [Crassulaceae]; species vero distincta, gregis *Primuloides* Franch., fortasse *S. Karpelesae* Hamet proxima, differt autem: foliis basalibus lineari-lanceolatis, inflorescentia multiflora, sepalis oblongis et carpellis fere ad basin liberis.

Planta perennis, parva, alpina, glabra, usque ad 5 cm. alta. *Radices* fibratae, usque ad 20 cm. longae. *Caudex hypogaeus* brevis et latus, apice squamis desiccatis late triangularibus cinctus. *Caudex epigaeus* latus et brevis; ejus folia partim semidesiccata, apice fracta, partim recentia, viridia, lineari-lanceolata, basi dilatata, apice subacuta, 15–20 mm. longa. *Caules floriferi* centrales, erecti, 3–4 cm. longi; eorum folia alterna, lineari-lanceolata, basi obtuse calcarata, apice subobtusa, 10–15 mm. longa. *Inflorescentia* late corymbosa, multiflora, foliosa, circiter 15×20 mm.; bractae lanceolatae, 6–6.5 mm. longae. *Flores* ansiopentameri, breviter pedicellati. *Sepala* basi non producta, oblonga, apice subobtusa, circiter 4 mm. lata. *Petala* subovata, basi lata, apice late mucronata, circiter 5 mm. longa, in sicco lutea. *Stamina* epipetala prope basin inserta, 3 mm. longa; stamina interpetala 5 mm. longa vel saepe in staminodia 2 mm. longa redacta; antherae oblongo-reniformes, obtusae. *Squamae nectariferae* subspathulato-quadratae, apice obtusissimae, 1×0.9 mm. *Carpella* fere libera, erecta, oblonga, longistyla, 6–6.5 mm. longa; folliculi pauciseminati, placentis rite ligamentosis. *Semina* oblonga vel ovata, utrinque alata, 1×0.4 – 0.5 mm., glabra.

Tibet: Shigatse, mountain side of Tsang-po, fls. and frt. Sept., C. S. Cutting and A. S. Vernay 97A.

Sedum shigatsense H. Fröderström, sp. nov. [Crassulaceae]; species gregis *Roborowskia* Fröd., differt autem ab omnibus speciebus adhuc cognitis: caulibus usque ad 10 cm. longis, foliis magnis obtusisque, petalis submucronatis et carpellis fere liberis.

Planta annua?, alpina, glabra, erecta, e basi pauciramosa, usque ad 10 cm. longa. *Caules steriles* non visi. *Caules floriferi* basi nudi, supra medium dense foliosi. *Folia media* subovata, basi obtuse calcarata, apice obtusa, usque ad 10 mm. longa; folia superiora minora, apice subobtusa, circiter 4 mm. longa. *Inflorescentia* subcorymbosa, pauciflora; bractae oblanceolatae, subobtusae, 3 mm. longae. *Flores* anisopentameri, breviter pedicellati (3–5 mm.). *Sepala* basi breviter obtuseque calcarata, subovata, apice obtusa, parum inaequalia, 3–3.5 mm. longa. *Petala* prope basin connata, subovata, apice submucronata, circiter 4 mm. longa, in sicco distincte lutea. *Stamina* omnia circiter 3–5 mm. longa, epipetala 0.5 mm. supra basin inserta; antherae ovato-reniformes, apice subacutae, 0.75 mm. longae. *Carpella* (immutura) erecta, brevistyla, non gibbosa, prope basin connata, circiter 3 mm. longa; folliculi multiovulati, placentis rite ligamentosis. *Semina* non visi.

Tibet: Shigatse, bank of Tsang-po, fls. Sept., C. S. Cutting and A. S. Vernay 62.

Doronicum latisquamatum C. E. C. Fischer, sp. nov. [Compositae]; a *D. thibetano* Cav. foliis caulinis basi haud constrictis, involucri bracteis multo latioribus, ligulis angustissimis recedit.

An erect *herb* 20–30 cm. high; stem slender, terete, brown or purplish, grey-pubescent with crisped multicellular hairs. *Leaves*: basal not seen; cauline about 6, alternate, distant 3–6 cm., membranous, green, sessile, oblong, sometimes somewhat oblique-ovate, obtuse with a minute apiculum, base suncordate or rounded, amplexicaul, 1.6–4.2 cm. long, 0.8–2.2 cm. wide, hispidulous above, pubescent below, not glandular, 5–7-nerved from the base, the inner one on each side of the midrib continued to the apex, veins much reticulated, obscure above, margins more or less sinuate-crenate with apicula from the sinuses. *Head* solitary, 3–4 cm. above the uppermost leaf, campanulate, 3.5–4 cm. diam. *Involucral bracts* about 17 in 2–3 series, those of the outer rows lanceolate to ovate-lanceolate, subacute, 13–19 mm. long, 5–7 mm. wide, hispidulous without, glabrous within except near the tip, green with purplish margins and tip outside when dry, the innermost row usually a little shorter, much narrower, acuminate, indumentum as in the outer except for the narrow hyaline glabrous margins. *Disk* flat, naked, pitted. *Ray florets* in 1–3 series; corolla ligulate, 14 mm. long, 0.7 mm. wide, very shortly, bluntly 2–3-toothed, tube 2 mm. long; pappus brown (at least when dry) 5 mm. long, minutely ascendingly barbellate; ovary fertile, elliptic to narrowly turbinate, compressed truncate, shortly stipitate, 1.7 mm. long, hairy; style very slender, arms erect, linear, flat, acuminate, glabrous. *Disc florets* narrowly funnel-shaped above a short cylindrical base, 4.5 mm. long, lobes 5, short, triangular, acute; anthers 2 mm. long, acuminate, base entire; style arms narrowly spatulate, minutely papillose; pappus and fertile ovary as in the ray florets, ovary rather more slender. *Achenes* not seen.

India: Sikkim, Tsamgo Lake, 12,000 ft., fls. Aug., C. S. Cutting and A. S. Vernay 70. "Common all along route, sometimes at high altitudes very low on ground on rocky soil (rocky shale all around Lake Tsamgo)." The colour of the florets is not stated, but from the dried specimens it appears that the ray florets are purple above and brownish at the base and the disk florets yellow-brown.

Saussurea Kingii C. E. C. Fischer, sp. nov. [Compositae]; *S. Thoroldi* Hemsl. similis sed caulibus ramosis, capitulis haud glomeratis, lobulis foliorum rotundatis, involucri bracteis 4–5-seriatis, seriebus 2 exterioribus extus puberulis apice rhomboideo-dilatatis, floribus numerosis recedit.

A branched *herb*; rootstock woody, up to 10 cm. long and 5 mm. diam., stem short, branches spreading, up to 8 cm. long, striate, brown or purplish. *Leaves* alternate, sessile, linear in outline, 4–11 cm. long, 1–1.7 cm. wide, pinnatifid from 1–5 cm. above the base, lobes alternate or opposite, oblong, rounded, apiculate, margins entire or more or less lobulate, glabrous, midrib rather broad in

lower half, one lateral nerve running to the apex of each lobe. *Inflorescence* of several to many capitula in a terminal corymb; peduncles 0.2 cm. long, sometimes subtended by a reduced leaf. *Capitula* campanulate, 1.5 cm. long, 1 cm. across. *Involucral* bracts in 4-5 rows; outermost fleshy, 7-9 mm. long, narrowly lanceolate and keeled below, dilated above into a rhomboid expansion 3 mm. long, with acute, apiculate angles, rarely much larger and foliaceous; the second row as long, ovate or broadly ovate, with wide purple membranous margins and a similar apical expansion; third row broadly ovate, membranous, acute, 8 mm. long, purple and sometimes denticulate at the apex, puberulous on the back, at least in the middle, as are those of first and second rows; fourth and fifth rows thinly membranous, slightly shorter, lanceolate, acute, glabrous. *Receptacle* convex, naked. *Florets* numerous; ovary quadrate or cuneate, compressed, 1.5-2 mm. long, smooth, edges margined and scalloped, rarely with a very narrow scalloped wing down one face (sub-trigonous), glabrous; style-arms short, linear, blunt, minutely puberulous; pappus 2-seriate, a few outer deciduous, ascendingly barbellate bristles 3 mm. long and an inner ring of white-plumose bristles rather thick and pale-brown below; corolla 8.5 mm. long, tube cylindric, slender below, slightly expanded in the apical $\frac{1}{3}$, lobes 5, linear-ensiform, subacute, 3.5 mm. long; anthers 4 mm. long, apiculate, tails united. *Achenes* similar to the ovary, brown, 1.7-2.5 mm. long.

Tibet: Lhasa, 12,000 ft., fls. and frt. Sept., *L. A. Waddell*, sine numero (type in Herb. Kew.); Numa, *H. M. Stewart* s.n.; 4 miles N. of Shigatse, 12,800 ft., on sandy shale on side of road, *C. S. Cutting* and *A. S. Vernay* 72. The corollas appear to have been purple in life.

This plant was recognised as a new species by the late Mr. J. R. Drummond, who proposed the name; though it is not clear why this name was proposed, I have accepted it as it has already been inscribed on herbarium sheets in the Kew Herbarium and elsewhere.

Androsace Cuttingii *C. E. C. Fischer*, sp. nov. [Primulaceae]; ab *A. Wardii* W. W. Smith foliis sessilibus, bracteis supra basin insertis pedicellis subaequilongis, pedicellis et calycibus pilis capitatis praeditis recedit.

Perennial *herb*; rootstock woody, up to 8 cm. long; stems several, up to 4 cm. long, more or less densely clothed with the remains of old leaves. *Leaves* rosulate, densely imbricate, rigid, sessile, linear to linear-spathulate, acute or subacute, 5-15 mm. long, 2-5 mm. wide, midrib obscure, rather conspicuously silvery-hairy when young, later bright-green, pubescent or hispidulous, margins ciliate. *Inflorescence* of umbels of 4-10 flowers; peduncles very short or up to 2 cm. long, puberulous or more or less white-hairy, sometimes with short capitate hairs intermixed, especially near the apex; bracts several, linear- to spathulate-oblong, attached

slightly above the base, 2-4 mm. long, acute or subacute, hispidulous and sometimes with short capitate hairs intermixed; pedicels 2.5-4 mm. long, hispidulous or pubescent and with short capitate hairs intermixed. *Calyx* 3-3.2 mm. long, puberulous and also bearing short capitate hairs without, glabrous within; tube funnel-shaped, as long as the 5 subcircular or broadly ovate, subacute, white-ciliate lobes. *Corolla* white with yellow centre; tube widely barrel-shaped to subglobose, 3.2-3.3 mm. long, constricted to a narrow mouth with a distinct lobulate rim; lobes 5, spreading, broadly obovate, entire, 3 mm. long, shortly conjoined at the base. *Stamens* 5, inserted at the middle of the corolla-tube; filaments very short; anthers ovate-lanceolate, 1 mm. long. *Ovary* subglobose or somewhat top-shaped, 1.5-2 mm. long; style 1-1.3 mm. long; ovules about 10. *Capsule* subglobose, crustaceous, 4 mm. long, whitish; seeds sub-cuneiform and angled or broadly ovate and flat, 2-2.5 mm. long, brown.

Tibet: four miles N. of Shigatse, on shale on mountain-side, 12,800 ft., fls. and frt. Aug.-Sept., *C. S. Cutting* and *A. S. Vernay* 75 (type in Herb. Kew.), 90; Raphu, in grassy valley, 15,000 ft., fls. white, yellow centre, June, *E. Norton* 19 (Mt. Everest Expedition 1922); Gyantse, fls. July-Sept., *H. J. Walton*.

XV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXX.*

NEW SPECIES AND RECORDS FROM BRITISH GUIANA.—N. Y. SANDWICH.

The descriptions and notes which follow are based mainly on a collection made in the autumn of 1935 by Mr. T. A. W. Davis, Assistant Conservator of Forests, on the Upper Demerara River, where some interesting new trees were discovered on the low iron-stone ridges; and on another valuable and beautifully dried set of herbarium specimens prepared by the entomologist, Mr. J. G. Myers, on his hazardous journey in the far interior in 1935-1936. Mr. Myers, who was searching for parasites of froghopper and of the yellow-headed cane-borer, at first worked on the Rupununi Savannahs where he collected many of the plants characteristic of this region. Later, following an arrangement with the Boundary Commission, he entered dense forests and crossed to the Kassikaityu River, and so to the Upper Essequibo at Onoro, near the Brazilian frontier. Here a meeting with the Commission failed to materialize and Mr. Myers, short of food and transport, without communications of any kind, and with only one reliable Indian to accompany him, accomplished a most dangerous journey down the New River to the base camp of the Commission at King Frederick William Falls on the Corentyne. Much of the country traversed during this journey has never before been visited by a white man, let alone

* Continued from K.B. 1937, 78.

by a botanist, although the limits were known to Robert and Richard Schomburgk a century ago. Mr. Myers' collection is therefore of the greatest interest and value, since—apart from novelties—he has re-discovered rare species which were collected by the Schomburgks, and has added others to the flora of the Colony which were known hitherto only from the Amazons region.

CAPPARIDACEAE.

Capparis (subgen. *Calyptrocalyx*) **surinamensis** J. C. Went apud Pulle in Rec. Trav. Bot. Néerl. **30**, 164 (1933), descr. emend. ac ampl. ex exemplis demerarensibus flores perfecte evolutos praebentibus.

Corymbi secus ramulos annotinos numerosi, aggregati, floribus corymborum inter sese intermixtis valde numerosis; pedicelli sub flore expanso 1.3–2.2 cm. longi. *Alabastra* ovoidea, sub ruptione ad 6 mm. longa. *Sepala* exteriora late ovato-oblonga, obtusa, circiter 6.5 mm. longa, circiter 6 mm. lata; interiora tenuiora, spathulata, obtusa, 6.5–7.5 mm. longa, 3–4 mm. lata. *Petala* obovato-spathulata, obtusa, unguiculata, stellato-pubescentia, 1–1.05 cm. longa, circiter 6 mm. lata. *Disci squamae* evolutae 4, oblongae, truncato-obtusae, senectute aliquantum emarginatae, ad 1 mm. longae atque 0.75 mm. latae. *Stamina* circiter 20; filamenta 7–7.5 mm. longa, basin versus sensim incrassata ibique satis dense stellato-pubescentia, superne fere glabra sed pilis stellatis raris praedita; antherae oblongae, circiter 1.5 mm. longae atque 1 mm. latae. *Ovarium* 1-loculare, subglobosum, dense stellato-tomentosum, circiter 1.75 mm. diametro, longitudinaliter tenuiter crebre costulatum; stipes 4.3–5 mm. longus, pubescens; stigma terminale, sessile, orbiculatum, glabrum.

BRITISH GUIANA. Great Fall, Demerara River, about 105 m. S. of Georgetown, alt. 200 ft. Oct. 25th 1935, *Davis* in *Forest Dept.* no. 2471: tall tree about 130 ft. high and 20 in. diam., growing on the slope of an ironstone ridge on rocky soil in mixed forest; scales on young leaves silvery; inflorescence and outer sepals dull purple with silvery scales; flowers creamy-white, petals faintly tinged with purple without. Vernacular name unknown.

The British Guiana material was obviously to be related to the remarkable new species of subgen. *Calyptrocalyx* which had recently been described from Surinam, but differed from the description in several important floral characters, viz. the structure of the disk, the indumentum of the filaments, and the shape and indumentum of the stipitate ovary. Comparison was therefore made with the type material of *C. surinamensis* which was kindly lent by the authorities of the Utrecht Herbarium. The flowers of the type, as admitted by Miss Went, were described from very young buds. Another bud has been dissected and compared with the characters of an almost equally young bud from the British Guiana tree. The result leaves little or no doubt that the material

from both colonies represents the same species and that the discrepancies between the description of the floral parts of *C. surinamensis* and those of the perfect flowers from British Guiana are due to the description having been made from extremely young and undeveloped buds. Thus the four scales or glands of the disk are sometimes very obscure in the young bud, but become obvious in the fully-opened flower; while the filaments and the stipe of the ovary are apparently glabrous in the young bud. Again, the authoress had no opportunity of determining the nature of the shape of the mature ovary, since in the very young bud this organ is of the same thickness as its stipe, the whole gynoeceum appearing linear and subsessile; while the stellate-pilose lateral stigma of her description seems to refer to the indumentum of the undeveloped ovary which is later sharply distinguished from the glabrous terminal stigma. Both collections agree excellently in characters of the leaves and indumentum of the inflorescence, and the conclusion is that the British Guiana material can safely be identified with *C. surinamensis* and may be employed for an emended and amplified description as given above.

MALPIGHIACEAE.

Byrsonima Poeppigiana Juss.

Onoro, Upper Essequibo River, Nov. 24th 1935, J. G. Myers 5732: riparian tree 50 ft. high, girth at breast height 2 ft.

Distr. Amazonian Brazil, Peru and Bolivia.

An interesting addition to the twelve species of the genus hitherto recorded from the Colony, see Kew Bull. 1935, pp. 311-316. The species should be placed in the key next to *B. Aerugo* Sagot, from which it is at once distinguished by the leaves which are not reddish-rusty and tomentose, but glabrescent and sparsely pubescent, on the lower surface. Further collection is desirable for confirmation of the above identification.

LEGUMINOSAE.

Swartzia longipedicellata *Sandwith*, sp. nov.; in seriem *Orthostylearum* juxta *S. acuminatam* Willd. ex Vog. ponenda, propter foliola alterna, racemum pauciflorum, pedicellos longos, alabastra magna floresque multo majores distinctissima.

Arbor parva, ramulis annotinis teretibus glabratissimis hornotinis puberulis. *Folia* omnino glabra sed secus rhachin minute obscure lepidota, petiolo rhachi petiolulis siccitate nigrescentibus; petiolus 3-4 cm. longus, gracilis, ad 2 mm. diametro, basi incrassatus; internodia rhacheos subteretis nec alatae 3-8-6 cm. longa, gracilia; petioluli 5-5-7 mm. longi; foliola 7-9, alterna vel potius nunquam stricte opposita, oblonga, terminalia obovato-oblonga, apice conspicue (saepe ad 1-7 cm.) anguste caudato-cuspidata, basi in foliolis infimis obtusa vel rotundata in superioribus in petiolulum cuneata, 7-15-5 cm. longa, 3-5-6-6 cm. lata, firme chartacea, siccitate supra olivaceo-nigrescentia subopaca vel vix nitidula, subtus brunnea

pallidiora, utrinque glabra, costa supra canaliculato-impressa subtus prominente nigrescente, nervis lateralibus primariis circiter 6-7 utrinque tenuibus et praesertim supra a secundariis parallelis numerosis vix distinguendis patulo-adscentibus tum longe (vulgo 6-10 mm.) a margine anastomosantibus et nervos limbales duplices formantibus supra fere planis inconspicuis subtus tenuiter prominulis, reticulatione tertiaria perobscura et sub lente tantum obvia sed areolis utrinque praesertim supra crebre verruculosus. *Racemi* infra folia e ramulis annotinis exorientes, pauciflori, ut videtur ad 5-6-flori; rhachis ad 14 cm. longa, nonnunquam multo brevior, nigrescens, glabra vel parce pubescens, obscure minute lepidota, ad 2.5 mm. lata; pedicelli similes, inferiores ad 5.2 cm. longi, superiores 2-3.8 cm. longi, crassi, saepe 2 mm. lati; bractae deltoideo-triangulares, pubescentes, parvae, vix ad 2 mm. longae; bracteolae supra medium pedicellum (raro in medio pedicello) sed longe infra calycem affixae, haud oppositae, lanceolato-subulatae, pubescentes, minutae, circiter 1.5 mm. longae. *Alabastra* ovoidea usque ovoideo-subglobosa, siccitate pruinoso-nigrescentia, valde corrugulata et verruculosa, glabra vel saltem glabrata, fere ad 1.5 cm. longa, 1.1-1.2 cm. diametro. *Calyx* demum in lobos 4 reflexos utrinque glabros ad 1.8 cm. longos 6-9 mm. latos profunde fissus. *Petalum* album, magnum; lamina utrinque glabra 2.5-3 cm. longa, 3.5-4 cm. lata. *Stamina* majora circiter 5-9, glabra, filamentis 2-3 cm. longis, antheris 2.5-3 mm. longis; minora valde numerosa, glabra, filamentis circiter 1.4-1.7 cm. longis, antheris 1.5 mm. longis. *Gynoecium* omnino glabrum, siccitate nigrescens; stipes 1.6-1.8 cm. longus; ovarium lineari-oblongum, rectum vel paulo curvatum, 0.8-1.2 cm. longum, 2-2.3 mm. latum; stylus circiter 1.1 cm. longus, curvatus. *Fructus* ignotus.

BRITISH GUIANA. Demerara River: Karaba Creek, about 110 m. S. of Georgetown, alt. 100 ft., Oct. 13th 1935, *Davis* in *Forest Dept.* no. 2451. Noted as a small tree to about 40 ft. high, very slightly buttressed, with thin blackish bark, growing near the river-bank in rather low forest which is occasionally inundated. Calyx pale green without, creamy-white within. Petal dead white. Stamens golden-yellow; anthers buff-white. Gynoecium whitish. Leaflets green below.

Vernacular name (Arawak), *Serebedan* (but this name is also given to *S. oblanceolata* Sandwith).

This extremely interesting new species, the nineteenth *Swartzia* to be recorded from British Guiana, runs down in the key to the species occurring in the Colony (see Kew Bull. 1934, 354-356) nearest *S. Schomburgkii* Bth. and *S. Jenmani* Sandwith. Affinity with these two species is clearly indicated by the general facies and venation of the leaflets, the glabrous white petal, and the form of the gynoecium with its long style; both of them, however, differ widely on account of the indumentum of the lower surface of their strictly opposite leaflets and inflorescence, the short pedicels, and

the much smaller buds and flowers. A slightly closer ally is the Amazonian *S. acuminata* Willd. ex Vog. which has glabrous leaflets with a verrucular upper surface as in *S. longipedicellata*.

Swartzia Jenmani *Sandwith* in Kew Bull. 1934, 361.

Upper Demerara River, about 110 m. S. of Georgetown, alt. c. 200 ft., Oct. 14th 1935, *Davis* in *Forest Dept.* no. 2455.

Vernacular name (Arawak), *Parakusan* (this name is also given to *S. Schomburgkii* Bth.).

Mr. T. A. W. Davis, who has rediscovered this species, which was described from a single collection by Jenman in the same region, writes as follows: "This species is abundant and replaces *S. Schomburgkii* in this district, at least from Malali upwards. It is a large tree with deeply-fluted bole consisting of thin plank-like buttresses, about 100 ft. high and 30 in. in diam., growing in green-heart forest on brown sand soil. Petal milk-white; small stamens rich yellow with brown anthers, large ones white with cream anthers; gynoeceum and calyx lobes creamy-white within; cauliflorous inflorescence, buds, young shoots and lower surface of leaflets with velvety, pale-brown indumentum."

The rediscovery of *S. Jenmani*, with full notes on its trunk and inflorescence, is highly gratifying, since the new material justifies its separation as a species from the very closely allied *S. Schomburgkii*. The chief diagnostic characters are all confirmed, but the style of *S. Jenmani* is shown to reach 1 cm. in length.

Swartzia grandifolia *Bong. ex Benth.*, var. *leiogyne* *Sandwith*, var. nov.; a planta typica gynoeccio maturo omnino glabro differt.

BRITISH GUIANA. Demerara River, about 110 m. S. of Georgetown, Oct. 21st 1935, *Davis* in *Forest Dept.* no. 2464 (typus): tree about 70 ft. high, 6 in. diam., in mixed forest on brown sandy loam soil; inflorescence cauliflorous; petal pale yellow with pale purple veins. Berbice-Demerara Cattle Trail Survey, June 1919, *Abraham* 215: tree 40 ft. high; standard cream with purple streaks; pod 12-18 in. long. Dense upland forest, Tumatumari, June-July 1921, *Gleason* 425; cauliflorous tree 40 ft. high.

The leaflets of these collections are conspicuously shining above, while the bracteoles are very minute, often attached at some distance below the base of the bud.

Vernacular name (Arawak), *Kerumite*.

Care must be taken to distinguish this variety from *S. xanthopetala* *Sandwith*, which differs especially in the wingless leaf-rhachis, the stronger indumentum of the leaflets and of the longer inflorescence, the larger bracts and the golden-yellow petal.

Vouacapoua macropetala *Sandwith*, sp. nov.; ab utraque specie adhuc descripta, et *V. americana* Aubl. et *V. pallidiore* Ducke, petalis multo majoribus, antheris longioribus, ovulis 2 differt; praeterea a *V. americana* foliolis pro rata latioribus, foliolorum nervis

lateralibus paucioribus haud patulis sed ascendentibus e costa angulo multo acutiore exorientibus, a *V. pallidiore* petalis glabris spathulatis distinguitur.

Arbor mediocris, ramulis apicem versus ferrugineo-pubescentibus. *Folia* petiolo, rhachi, petiolulis eis *V. americanae* et *V. pallidioris* similibus; foliola in exemplis visis semper 7, oblongo-lanceolata, elliptico-oblonga vel rarius ovata, apice ut in *V. pallidiore* longe acuminata, basi rotundata vel saltem obtusa, 9–18.5 cm. longa, 3.3–7.4 cm. lata, firme chartacea, glabra, nervis lateralibus primariis circiter 7–9 ut in *V. pallidiore* ascendentibus longe a margine anastomosantibus, rete venularum paginae inferioris quam in *V. americana* minus prominulo. *Inflorescentia* indumento generis typico fulvo; bractae ad 2.5 mm. longae; pedicelli 2.5–4 mm. longi. *Alabastra* matura siccitate flavo-fulvo-sericea, 4–6 mm. longa. *Calycis* tubus campanulatus, 2 mm. longus; lobi late oblongi, obtusi, utrinque flavescenti-tomentelli, 5–5.5 mm. longi, 3–4 mm. lati. *Petala* flava, spathulata, basi unguiformi-attenuata, 7.75–8 mm. longa, 3.5–4 mm. lata, utrinque glabra. *Stamina* glabra; filamenta seriei longioris 3.2–4.5 mm. longa, seriei brevioris 2.2–3 mm. longa; antherae 2.2 mm. longae. *Ovarium* fulvo-tomentosum, oblongum, 3–5 mm. longum, ad 2 mm. latum, in stylum superne glabrum vel glabrescentem 1.3–1.5 mm. longum attenuatum; ovula 2. *Fructus* ignotus.

BRITISH GUIANA. Upper Demerara River, about 110 m. S. of Georgetown, alt. c. 100 ft., Oct. 18th 1935, *Davis* in *Forest Dept.* no. 2460: tree about 85–90 ft. high, 16 in. diam., in mixed forest on sandy clay soil; flowers yellow, the calyx inclining to orange-buff; indumentum on inflorescence brownish, that on young fruit paler; undersurface of leaflets inclining to glaucous.

Vernacular name (Arawak), *Sarabebeballi*.

The genus *Vouacapoua*, which was reinstated by Baillon in *Adansonia*, 9, pp. 206–212, t. iv, is noted for the excellent hardwood of *V. americana*, both in French Guiana and in Amazonian Brazil, where it is known by the name Acapú. The second species, *V. pallidior*, was recently described by Dr. Ducke from material collected on the Rio Negro, where the trees were also known as Acapú, see *Tropical Woods*, no. 31, pp. 15–16. Examination of Spruce's gathering (no. 2061) from San Gabriel on the Rio Negro shows that this collection must be referred to *V. pallidior*, as was surmised by Ducke.

Mr. Davis's discovery of a new *Vouacapoua* in British Guiana is apparently the first record of this genus for the Colony. His material shares certain characteristics of both of the hitherto described species, but differs from both in the much longer and somewhat broader petals, the longer anthers, and the longer ovary which bears 2 ovules. In *V. americana* and *V. pallidior* the petals are 4–5.5 mm. long and 1.9–2.5 mm. broad, the anthers are 1.4–1.75 mm. long, and the ovary is shorter and more ovoid and bears a single ovule.

Apart from these distinctions, the British Guiana plant is very similar to *V. pallidior* in the general facies and venation of the leaflets, which differ strikingly from those of *V. americana* in characters indicated in the above diagnosis and description. On the other hand, the petals of *V. pallidior* are rusty-pubescent in the lower half, especially on the outer surface, whereas those of *V. americana* and the British Guiana material are glabrous. The leaves of the latter are uniformly 7-foliolate, whereas the larger leaves of *V. americana* and *V. pallidior* are 9-foliolate, or occasionally 11-foliolate in the former. The presence of 2 ovules, if constant, suggests a passage towards the monotypic genus *Batesia* which Baillon did not feel was really distinguishable from *Vouacapoua*. No Aublet specimen of *V. americana* has been found in the Herbarium of the British Museum.

***Cassia racemosa* Mill. sens. Benth.**

Upper Essequibo River, between Camp 2 and Onoro, Nov. 22nd 1935, J. G. Myers 5709; a small slender riparian tree of the lowest storey.

Distr. Amazonian Brazil to Colombia, Peru, Bolivia and Paraguay. This is the first collection from British Guiana to be received at Kew, since *Robert Schomburgk* 895 is proved by his manuscript field notes to have been gathered at Pedrero, on the Rio Negro, Brazil.

***Paloue induta* Sandwith, sp. nov.**; a speciebus adhuc descriptis propter indumentum totius inflorescentiae, praeterea ovarium villosulo-lanato-tomentosum distincta; species affines *P. riparia* Pulle floribus minoribus, bracteolis parvis, ovario glabro, *P. guianensis* Aubl. petalis valde distinctis gaudent.

Frutex riparius, ramulis cinnamomeis puberulis vel glabratis. *Folia* oblongo-lanceolata vel lanceolata, apice acuminata, basi subrotundata vel in exemplis parvis cuneata, usque ad 11 cm. longa ac ad 3.7 cm. lata (verosimiliter nonnunquam majora), tenuiter coriacea, glabra, venatione generis typica; petiolus 3-4 mm. longus. *Racemi* solitarii axillares vel apice ramulorum 2-3 fasciculati, 4-6 cm. longi, rhachi pedicellisue pilis brevibus flavo-chryseis subnitentibus dense patule vel fere patenter pilosulis; bractee late ovatae, rotundato-obtusae, ad 8 mm. longae, extra dense pubescentes; pedicelli 6-9 mm. longi; bracteolae generis typicae, 7-10.5 mm. longae, extra dense griseo-pubescentes. *Calycis* stipes 7-11 mm. longus, pilis arcuato-ascendentibus dense pilosulus; tubus 8-10 mm. longus atque latus, similiter indutus; segmenta extra juventute pube grisea deterili induta, demum glabrata, intus siccitate purpurea, inaequalia, late ovata vel oblonga, obtusa, 1.3-1.5 cm. longa, 0.6-1.3 cm. lata. *Petala* 5 glabra, oblonga vel oblongo-linearia; unum multo majus, acutum, 1.3-1.4 cm. longum, 3-5 mm. latum; 2 minora, obtusa, 3.5-5 mm. longa, circiter 1.25 mm. lata; 2 minima, obtusa, circiter 1.8 mm. longa atque 0.75 mm. lata. *Stamina* 9;

filamenta basi breviter (ad 1.5 mm.) aequaliter connata, aequalia, 4.8-5.3 cm. longa, pilis longis debilibus flexuosis laxae induta, superne glabrescentia; antherae glabrae, 7-7.5 mm. longae, 1.5 mm. latae, apice apiculo rotundato-obtuso circiter 0.2 mm. longo terminatae. *Ovarium* pilis flavo-albis dense lanato-tomentosum, stipite glabro; stylus basi indumento ovarii indutus, ceterum glaber, circiter 5-6.5 cm. longus. *Fructus* deest.

BRITISH GUIANA. Upper Essequibo River: Mataruki River, between camps 1 and 2, Dec. 3rd 1935, *J. G. Myers* 5801; noted as a small riparian bush.

***P. riparia* Pulle.**

The following collections from British Guiana agree well with the type collection, *Pulle* 154, in the Utrecht Herbarium: Mazaruni River, *Appun* 263; Upper Mazaruni River, 1863-1864, *Appun* 1702.

Distr. Surinam.

A well marked species on account of the small bracteoles and flowers, the glabrous anthers and gynoecium. There is a single large petal up to about 7.5 mm. long and 3 mm. wide, and 4 small petals of varying size from 1-3.5 mm. long and about 1 mm. wide.

***P. guianensis* Aubl.**

In Enum. Pl. Surinam, p. 212, Pulle has a misleading note which suggests that there is a discrepancy between Aublet's figure of this species and his specimen at the British Museum. This is not so. The specimen which may with justification be taken as Aublet's type shows a flower with three long, subequal petals which accords with his figure. Other sheets from French Guiana in Herb. Mus. Brit., coll. *Rothery*, *Martin*, *van Rohr*, also exhibit flowers with 2-3 long narrow petals of more or less equal length. No gynoecium is present on Aublet's specimen, and only a single anther, which is glabrous. The large sepals are 1.6-1.8 cm. long and up to 7 mm. wide; while the large spatulate-linear petals are 2.5-2.9 cm. long and 3-6 mm. wide.

***P. brasiliensis* Ducke.**

This very distinct species is remarkable for its short filaments and style which are less than 2.5 cm. in length. In *Ducke* 10882 there are at least four petals over 1 cm. long, and they are conspicuously ciliate.

***Hymenaea palustris* Ducke.**

Upper New River, Dec. 11th 1935, *J. G. Myers* 5868; "very tall riparian tree (from which I made bark canoe), 153 ft. high, first branch at 102 ft., girth at breast height 8 ft. 6 in." No. E of "Last Small Set," *Robert Schomburgk*, with note that bark canoes were made from the tree; specimens in both Herb. Benth. (unidentified) and Herb. Hook. (identified as *Hymenaea* sp.).

Distr. Amazonian Brazil. Perhaps not more than a variety of *H. oblongifolia* Huber.

ROSACEAE.

Licania cuprea *Sandwith*, sp. nov.; inter species cymas secus inflorescentiae rhaches pedunculatas gerentes *L. densiflorae* Kleinhoonte affinis, foliis jam adultis subtus tomentosis, inflorescentiis gracilibus ramulis haud densifloris, bracteis bracteolisque angustis subulatis, lobis calycinis angustioribus statim distinguitur.

Arbor mediocris, ramulis summis dense fulvo-tomentosis, lenticellis in ligno vetere glabrescente tantum obviis. *Stipulae* persistentes, subulatae, 3.5–5 mm. longae. *Folia* lanceolata, oblongo-lanceolata, elliptica, vel oblonga, rarius subovata, apice attenuata acuta vel acuminata vel cuspidata, basi rotundata usque acuta, 4.5–12 cm. longa, 2–4.3 cm. lata, crasse coriacea, supra nitidula siccitate saepe nigrescentia costa pilosulo-pubescente excepta glabra costa nervisque impressis manifestis reticulatione sub lente tantum cernenda, subtus flavescenti-cinerea arcte arachnoideo-tomentosa nervis omnibus prominentibus rete venularum intricato venulis crassis inter tomentum persistens manifestis, nervis lateralibus primariis utroque costae latere 8–10 arcuato-ascendentibus; petiolus 0.5–1 cm. longus, supra vix vel obscure tantum canaliculatus, indumento ramulorum. *Inflorescentiae* axillares et terminales, saepius e basi ipsa ramosae, graciles, vulgo 4–10 cm. longae, ubique pilis brevibus patulis flavo-brunneis vel brunneis dense tomentosae; rhachis vulgo 1 mm. diametro vel gracilior; rami pauci, ascendentes, basales ad 5 cm. longi, ceteri breviores nonnunquam bracteis foliaceis stipulisque subteni; bractee basi pedunculorum angustae, lanceolato-subulatae, 1–1.75 mm. longae; cymae conspicue pedunculatae, pedunculo 5 mm. longo, simpliciter 2–3-florae vel rarius dichotomae; bractee cymarum ceteris similes; bracteolae prope medium pedicellum similes sed minores; pedicelli ad 2.5 mm. longi. *Alabastra* colore pallide purpureo saepius suffusa, villosulo-lanato-tomentosa. *Calycis* tubus campanulatus, circiter 1.5 mm. longus atque 2.5–3 mm. diametro, intus tela araneosa albida praeditus; lobi deltoideo-lanceolati usque subovati, obtusi, circiter 1.3–1.7 mm. longi, 1–1.2 mm. lati, intus griseo-tomentelli. *Petala* nulla. *Stamina* 3. *Ovarium* dense rufo-brunneo-villosulum; stylus circiter 1.7–2 mm. longus, albo-pilosus. *Fructus* plus minusve subgloboso-pyriformis, 3–3.5 cm. longus, 2.5–3 cm. diametro, densissime molliter cupreo-fusco-tomentosus, haud costatus, basi in stipitem 1.5–2 cm. longum 3–5 mm. latum contractus.

BRITISH GUIANA. Demerara River, Dec. 1891, *Jenman* 6300 (typus floris). Western side of Berbice-Demerara watershed, on hill-top in Muri bush at heads of Paidaka and Mauri Creeks, fl. Nov. 6th 1919, *Hohenkerk* in *Forest Dept.* no. 801. Christianburg, Demerara River, fr. Feb. 14th 1910, *C. W. Anderson* in *Forest Dept.* no. 456. Moraballi Creek, Essequibo River, near Demerara-Essequibo watershed, fruit Sept. 18th 1935, *Davis* in *Forest Dept.* no. 2421 (typus fructus): tree about 70 ft. high, 10 in. diam., on white sand in wallaba forest; undersurface of leaves dirty

rusty-white; fruit densely covered with bright coppery-brown indumentum.

Vernacular names (Arawak): *Aruadanni*, *Muri Kantaballi* (fide C. W. Anderson); *Unikiakia* (fide Hohenkerk); *Kunoko* (fide Davis).

Very distinct among the British Guiana members of this critical genus, and not agreeing with the material or description of any known species, but the names of South American *Licaniae* will only be settled by monographic study and the assembling together of the very numerous types.

TURNERACEAE.

Turnera brasiliensis Willd. ex Schultes.

New River, between camps 10 and 11, Dec. 21st 1935, J. G. Myers 5896: slender undershrub in tall mixed rain forest; flowers with decided scent of heliotrope.

Distr. Amazonian Brazil.

The material agrees with the descriptions of Urban and with Brazilian specimens in all important respects, but the large leaves have strikingly long (up to 3 cm.) petioles, and the margins of the upper half of most of the laminae are conspicuously and irregularly dentate-serrate. The Brazilian material itself is variable, and it does not seem advisable to found a new variety upon the evidence of a single collection.

CUCURBITACEAE.

Posadaea sphaerocarpa Cogn.

Amakura River, Dec. 1890, *Jenman* 6288. Yarikita Police Station, at junction of Yarikita and Amakura Rivers, Jan. 1920, *Hitchcock* 17604.

Distr. Cited only from Colombia by Cogniaux in Engl. Pflanzenreich, iv. 275. 1. p. 252 (1916), but the distribution can be extended as follows: COSTA RICA; Aragon, Turrialba, Jan. 1899, *Pittier* 13211, distributed as *Sechium edule* Sw. (Kew!). TRINIDAD; Cunupia, near Mrs. Woodcock's, a vine with orange-like fruits, Jan. 1917, *Broadway* in *Herb. Trin.* no. 9430 (*Herb. Trin.*!).

RUBIACEAE.

Ixora Davisii *Sandwith*, sp. nov.; ob reticulationem foliorum obsoletam haud cernendam, inflorescentias terminales sessiles contractas congestifloras, flores cymarum sessiles, corollas extra puberulas, praesertim bracteas cymarum bracteolasque florum pro genere magnas ovatas conspicue connatas notabilis.—? *Patabea coccinea* Aubl. Hist. Pl. Guiane, 3, t. 43 (1775). ? *Cephaelis sessiliflora* Willd. Sp. Pl. 1, 979 (1797).

Frutex altus vel arbor parva, ramulis glabris laevibus teretibus vel apicem versus leviter sulcatis. *Stipulae* vagina 2-3 mm. longa, aristis 0.75-4 mm. longis, extra glabrae, intus plus minusve pubescentes. *Folia* anguste elliptica usque ovato-oblonga, apice late

acute acuminata, basi obtusa vel acute cuneata, in petiolum decurrentia, 9.5–18.5 cm. longa, 4.8–7.5 cm. lata, coriacea, glabra, siccitate supra griseo-olivacea usque purpurascenti-nigrescentia, subtus pallide brunnea, costa supra plana subtus prominente, nervis lateralibus primariis utroque costae latere circiter 10, supra planis vel undulato-impressis, subtus tenuissime prominulis, nervis lateralibus intermediis vix cernendis, reticulatione omnino impressa neque cernenda sed pagina utraque crebre verruculoso-rugulosa; petiolus circiter 1.3–1.5 cm. longus. *Inflorescentiae* terminales, sessiles, thyrsoidae, vulgo arcte congestiflorae, circiter 2 cm. longae, ad 4 cm. latae, ramulis primariis ad 1 cm. longis sed saepe brevissimis, ubique puberulae; bractae omnes pro genere latae, insigniter plus minusve connatae, ultimae sub cymis ovatae, obtusae, nonnunquam brevissime cuspidatulae, usque trientem inferiorem vel medium connatae, 3–4 mm. longae, 3.5–5 mm. latae, calyces amplectentes, extra puberulae atque ciliolatae, intus adpresse sericeo-pubescentes; bracteolae similes sed aliquantum minores, indumento simili, alte connatae, calycem arcte amplectentes atque fere aequantes. *Flores* cymarum sessiles, alabastris solemniter rubris. *Calyx* campanulatus, circiter 3 mm. longus atque latus, extra furfuraceo-puberulus, intus adpresse sericeo-pubescent, lobis late breviter deltoideo-triangularibus ad 0.5 mm. longis 1.5–2.2 mm. latis. *Corolla* tubo solemniter rubro 9.5 mm. longo, circiter 1.3 mm. diametro, extra furfuraceo-puberulo, intus glabro; lobi intus albi, valde contorti, deltoideo-lanceolati, acuti, 6–7 mm. longi, ad 3 mm. lati, extra sparse puberuli vel glabrescentes, intus plus minusve glabri. *Antherae* sessiles, oblongae, apiculatae, 2.6 mm. longae. *Ovarium* circiter 1 mm. longum; stylus glaber, 11 mm. longus, stigmatibus glabris circiter 1.2 mm. longis. *Fructus* subglobosus, ad 9 mm. longus, circiter 8 mm. diametro, inferne glabratus, superne apicem versus puberulus, basi bracteis bracteolisque persistentibus cinctus, apice calycis reliquiis ad 1.5 mm. longis vix 2.5 mm. latis coronatus.

BRITISH GUIANA. Upper Demerara River, about 110 m. S. of Georgetown, alt. 100 ft., Oct. 15th 1935, *Davis* in *Forest Dept.* no. 2457: stout bushy undergrowth shrub, about 7 ft. high, growing in Mora forest near a creek on clay soil; inflorescence and calyx dark red-brown; buds deep red; corolla tube deep red, lobes milk-white within.

A very distinct plant, not obviously related to any known species of *Ixora*, but probably to be placed near the Guiana *I. graciliflora* Bth., *I. surinamensis* Brem., and *I. Versteegii* Brem., or the Brazilian *I. Spruceana* Muell. Arg. Comparison with the figure of Aublet's *Patahea coccinea* immediately suggested a resemblance which is confirmed by examination of the type specimen in Herb. Mus. Brit. The leaves, stipules and inflorescence all agree in general characters and facies, but the secondary lateral nerves and a certain amount of loose open reticulation are apparent (although extremely fine) on the lower surface of Aublet's leaves, as in his figure. Aublet's

inflorescence is young and no dissection can be made; there are certain discrepancies between his description and that of *I. Davisii*, e.g. the shape of the calyx lobes and bracts (the latter, indeed, look much more acute in Aublet's plant than in the British Guiana material); but there seems to be little doubt that *I. Davisii* must be very closely related to, if not conspecific with, *Patabea coccinea*. The possibility of such an identification for Aublet's genus *Patabea* is of much interest in view of the fact that all French botanists, Willdenow, De Candolle, Kunth, Bentham and Hooker, and Schumann, have invariably referred it to the *Psychotrieae*, and have allied or reduced it to *Psychotria* or *Cephaelis*. Both Aublet's trivial *coccinea* and the later trivial *sessiliflora*, with which Willdenow renamed the plant when he placed it in *Cephaelis*, are preoccupied in *Ixora*.

APOCYNACEAE.

Geissospermum sericeum Miers.

Malali Rapid, Demerara River, about 85 m. S. of Georgetown, Oct. 4th 1935, *Davis* in *Forest Dept.* no. 2444: tree over 100 ft. high, about 20 in. diam., in mixed forest (burnt) among concretionary ironstone boulders on gravelly soil; bark yellowish-brown, furrowed; bole fluted, with window-like slits; leaves whitish below; flowers whitish within, corolla with silky-brown indumentum without like the calyx and branchlets.

Vernacular name (Arawak), *Manyokinaballi*.

Distr. Surinam, French Guiana, Amazonian Brazil and Bolivia.

The first record from British Guiana.

CONVOLVULACEAE.

Jacquemontia ciliata *Sandwith* in Kew Bull. 1930, 156.

In Indian provision field, Karinyi, Upper Essequibo River, Nov. 26th 1935, *J. G. Myers* 5751.

Distr. Trinidad, Colombia (*Lawrance* 110, distributed as *J. pentantha*) and Costa Rica.

SOLANACEAE.

Solanum sacupanense *Rusby*.

BRITISH GUIANA: Upper Essequibo River, between Onoro and Karinyi, Nov. 24th 1935, *J. G. Myers* 5734: "suffruticose plant forming pure societies at water's edge along low stretches of bank." Without locality, 113 S, *Robert Schomburgh*. Essequibo River, Sept.-Oct. 1881, *Jenman* 1125. Mazaruni River, Sept. 1880, *Jenman* 778. Cuyuni River, common along banks and growing in water, fls. white, Oct. 1904, *Barlett* in *Jenman Herb.* 8253.

BRAZIL: Rio Branco, bank near San Marcos, Jan. 1909, *Ule* 7830: 1-3 ft. high, fls. white.

VENEZUELA: Sacupana, Lower Orinoco, April 1896, *Rusby and Squires* 22 (type no.).

This has been confused with *S. heterophyllum* Lam., which has larger flowers with much longer anthers, and a very different calyx with shorter and broader, less subulate, teeth. *S. sacupanense* evidently varies in the strength of its armature, and may have more lobed leaves than in the type collection.

MYRISTICACEAE.

***Virola venosa* (Bth.) Warburg sens. van Ooststroom.**

Near Itaburro Creek, Demerara River, about 130 m. S. of Georgetown, fl. Nov. 2nd 1935, *Davis in Forest Dept.* no. 2478: tree about 120 ft. high and 20 in. diam., very slightly buttressed, in mixed forest on brown sand soil; latex red; inflorescences and flowers pale yellow. François Creek, Mahaicony River, Demerara Co., fr. March 23rd 1934, *Davis in Forest Dept.* no. 2363: unbuttressed tree, about 105 ft. high, in mixed forest on brown sand; fruits brown; fleshy aril bright red; seed pale ashy-brown.

Vernacular name (Arawak), *Hill Dalli* (*Dalli* is *V. surinamensis* (Rol. ex Rottb.) Warb.).

Distr. Guiana, Amazonian Brazil and Peru.

XVI—THE RACES OF SORGHUM.* I. H. BURKILL.

The opportunity of reviewing Snowden's valuable book is an invitation to frame from his materials the history of *Sorghum* in cultivation. The data are all present, but he has not developed his subject from this angle.

The plants he deals with do not occur in a wild state, and their history is thus intimately associated with that of man. They furnish a source of grain, which is eaten sometimes slightly immature, usually fully mature, either parched or boiled, or, after grinding, as a gruel, porridge, or unleavened (rarely leavened) bread. The grain of inferior varieties man may feed to his domestic animals, and he himself is able to fall back on it in times of scarcity; or he may ferment it to provide a beverage. His cattle are fed on the straw; and the stems of those which contain sugar he may use for chewing. Dry stems that are not sweet can be used for building houses and shelters and in other similar ways; and there are kinds with special uses such as the making of brooms: some are grown for the red dye that they produce. In European hands certain sweet kinds have been grown for making syrup and sugar. The uses may be mutually exclusive; thus, for example, if the red dye be plentiful the grain is of little value: and man, unable to secure all his requirements from a single variety, has selected his sorghums according to his needs and grows them side by side. This is a fact which has complicated the history of the crops.

* "The Cultivated Races of Sorghum" by J. D. Snowden, printed for the Trustees of the Bentham-Moxon Fund, London, 1936: pp. viii+274, 8vo., price 10s. 6d.

Asia, having rice as a cereal and the sugarcane as a source of sugar, has accepted sorghum as a supplementary food crop, its value lying in its drought-resistant qualities. In the same way America, which is largely dependent on maize as a cereal, has developed the sorghum crop only in areas where the climate is too dry for maize. Africa, on the other hand, with its precarious system of shifting cultivation, has felt an intense need for drought-resistant cereals and has brought the oldest types, but by no means all the cultivated sorghums, into being.

Snowden enumerates 31 species, embodying 157 varieties which contain 571 forms. None of his varietal names is repeated, so that, should another botanist decide to unite certain species, the varietal names need suffer no disturbance. The method displayed is worthy of all praise: step by step he catalogues his material, giving each species its characters and affinities and illustrating each with figures which show the same parts drawn to a constant scale. At the end of each description he summarises the uses and cultural requirements. He almost apologises for calling them species, i.e., for adopting a very narrow specific standard, but he is entitled to do so and is consistent throughout.

He accepts the opinion that the cultivated sorghums are polyphyletic in origin, some having been derived from *S. arundinaceum*, some from *S. aethiopicum*, some from *S. verticilliflorum*, and some possibly from *S. sudanense*. He rounds off his work by an account of these wild species and their closest allies. The 31 cultigens (species) he groups into six "subseries," linking them (p. 239) with their presumed wild parents.

The collection of sorghums on which Snowden's work has been based consists of more than 3000 specimens, which have been brought together at Kew by a triumph of co-operation between the Royal Botanic Gardens and the Agricultural Departments of the Colonies and the Union of S. Africa. The sorghum-growing regions of Africa and Asia have all contributed to this collection and what is available in other herbaria has been examined. Using Snowden's varieties as units, the writer of these pages, satisfied that the book furnishes an excellent basis for a phytogeographical and ethno-botanical outline, has analysed it in various ways. He finds the distribution of these to be as follows: India proper, with Ceylon, 43; Tanganyika Territory 40; Anglo-Egyptian Sudan 37; Africa, north of the Gulf of Guinea, 27; Equatorial west Africa 22; the "Horn of Africa" 21; Rhodesia 18; Nyasaland 14; Egypt 12; Uganda and Kenya 11; Transvaal, Natal, Basutoland and Zululand 11; Arabia 10; Burma 10; China and Korea 8; Angola and South West Africa 8; Iraq, Persia and Afghanistan 5; Portuguese East Africa 4; Malaysia 4; the Cape Colony 3. It is probable that India stands too high in this list and that Portuguese East Africa is too low, but the impression given of the relative importance of sorghum in the different units of land is broadly true. Inasmuch as India

originally received sorghum from Africa, its high place in the list is unusually interesting. The Indian distribution of varieties is as follows: Deccan Plateau 21 (excluding recent introductions); the north-west of India 17; Coromandelia 14; Central Provinces 13; eastern Gangetic Plain and adjoining hills 11; and Malabar 7.

With very few exceptions the cultivated sorghums are grown with the aid of less than 40 inches of rain. These exceptions are practically confined to a limited area in the extreme west of Africa which lies between Cape Verde and Cape Three-Points. Here the rainy season lasts for 6-7 months. For this area *S. margaritifera* has been evolved—a small-grained variety useful for human food. *S. gambicum* is also grown in this region, its grain being mainly used for feeding stock and for making beer. Behind this area and the coastal fringe of evergreen forest, which extends east and west of the Niger delta, is drier country with a shorter and more erratic rainfall; over it the main grain sorghum is *S. guineense*, supplemented by *S. exsertum*. Here also is found *S. mellitum*, a species which has sweet stems used for chewing. Snowden considers that all these five species are derived from *S. arundinaceum* and in this parentage their fitness for the climate would originate. None of the four species which are definitely grown as grain-crops extends eastwards beyond the Nile valley; and therefore there has been no free opportunity for their transport to Asia.

As the country becomes still drier towards the northern limits of Nigeria a transition zone is entered; and the following are recorded as being cultivated there: (i) of those species already mentioned, *S. margaritifera*, 1 variety; *S. guineense*, 5 varieties; *S. mellitum*, 1 variety; *S. exsertum*, 2 varieties; (ii) of others intruding from the east: *S. membranaceum*, *S. notabile*, *S. nigricans* and *S. durra*, each in 1 variety, and *S. caudatum*, 3 varieties. In this area *S. caudatum* is the most important cereal grain; it is also grown extensively around Lake Victoria, from where it extends northwards along the Nile valley as far as Khartoum, as well as southwards into Tanganyika Territory. Its cultivation has never extended, however, as far as the eastern seaboard, and it has never been conveyed to India by Arab or other Asiatic agency.

Turning to the sorghums of the South, *S. caffrorum* is everywhere grown south of Latitude 5° S. as a cereal crop; while European farmers have extended as fodder crops the cultivation of certain varieties of this species which possess sweet stems. For various reasons it is suspected that this species has not had such intelligent selection as have had the sorghums grown north of the equator. At any rate it has not been so ennobled as to close the door to the drifting in of superior varieties, such as *S. basutorum*, nor to exclude the use towards the north of *S. simulans* as a beer-crop and for chewing.

The evergreen forests of the Congo basin with their heavy rainfall and high humidity effectively separate the sorghums of West Africa from those of the south; and this part of the continent

apparently has not evolved any sorghums: its forests stretch from the west coast almost as far east as the Rift valley. There is another, though less-pronounced, area of higher rainfall on the east coast within which is the hinterland of Zanzibar, where hilly country causes the Trade Winds from the Indian Ocean to deposit their moisture. This area has evolved its own type of sorghum, *S. elegans*, in adaptation to its higher rainfall. Between it and the evergreen forests of the Congo there is drier country in which the fully interfertile species of the south and the north can meet, and this drier country seems to constitute a melting pot and recasting factory where immigrants lose their identity and selection has new forms to draw upon. Apparently none of the southern types has passed intact northwards through it, nor have any of the northern types passed southwards. Thus there is a complete barrier right across Africa. This barrier limits the Rhodesian varieties. For instance Snowden enumerates 18 (belonging to 5 species): of them, 11 also occur in Tanganyika, 6 in Nyasaland and 6 in the Belgian Congo, but none of the varieties representing 4 of these species (*S. conspicuum*, *S. Roxburghii*, *S. coriaceum* and *S. caffrorum*) occurs north of the equator, though varieties of the fifth species do so. This fifth species, which is *S. nigricans*, differs from the other four in its principal use being for making beer, having dark-coloured, bitter grain which renders it unattractive as a source of flour. It is suggested that a tendency exists for crops which administer to pleasures to be dispersed rather more freely than ordinary food crops. Another example of this is the wider distribution range of some of the sweet-stemmed forms which are used for chewing.

The north-eastern parts of the heart of Africa, according to Snowden's data, are a centre in which numerous varieties have arisen. He enumerates 38 as occurring in the Anglo-Egyptian Sudan. Of these, 5 extend as far west as Nigeria, 12 to Eritrea or Abyssinia or both, and 7 to Egypt, though some only as recent immigrants. The 3 important species are *S. caudatum*, *S. durra* and *S. subglabrescens*, none of which plays a part in the agriculture of the wetter parts of west Africa, nor in the remoter south. The same three species are represented towards the dry "Horn of East Africa" (Eritrea, Abyssinia and Somaliland) in 16 varieties and it is remarkable that only three others have been recorded there which are derived from different species.

Besides these three species, *S. melaleucum* and *S. rigidum* serve as luxury crops yielding a superior quality of flour. *S. rigidum* must have been selected from the ancestry of *S. durra* and *S. subglabrescens*; but *S. melaleucum* is allied to *S. nervosum* and will be referred to later. A third associate is *S. notabile* which, unlike the other two, extends into Nigeria. The only reason which suggests itself for this migration is that the grain is said to keep better when stored—a valuable asset in a country liable to famine.

There is no evidence to show that any variety of sorghum originated in Egypt, nor are there any certain indications that the

crop was grown there in early Egyptian times, although commercial communication existed both up the Nile and down the Red Sea. The Romans would surely have recorded its occurrence if it had been grown in the time of the Caesars ; and it is possible, though there is no actual evidence, that its introduction dates from the time of the Arab conquest in A.D. 641. It would seem that the crop was introduced from the Upper Nile area, and that varieties of *S. durra* were the first to be grown. It is noteworthy that varieties of *S. subglabrescens* have not reached Egypt. Though this species has a common ancestry with *S. durra*, it appears to have originated eastward of the grazing lands of Abyssinia and would thus have been inaccessible by the Nile route to Egypt. It also appears to have been evolved at a later date than *S. durra* ; for whereas the latter has spread through Egypt, Palestine, Arabia, Persia and India, *S. subglabrescens* is known only outside Africa in Arabia and southern India, i.e., along the maritime trade routes from east Africa. It is reasonable, therefore, to presume that *S. subglabrescens*, by being evolved at a later date than *S. durra*, missed the opportunities for expansion which the latter gained.

Snowden recognises sixteen varieties of *S. durra*. These are distributed as follows : Sudan 9 ; Hindustan 7 ; Egypt 6 ; Eritrea and Somaliland 5 ; the Deccan 4 ; Arabia 3 ; Baluchistan 3 ; the Central Provinces of India 2 ; Coromandelia 2 ; Malabar 2 ; Afghanistan 1 ; Nigeria 1 ; and in European gardens 1. Seven varieties are confined to Africa and six to Asia, of which three are unknown outside India, while the variety *javanicum* is also probably of Indian origin. Allowing for the time factor in the evolution of these distinctive asiatic varieties one can assume that *S. durra* reached India by the sea route and not by way of Egypt and Arabia.

Furthermore, this assumption is strengthened on observing that India seems to have evolved the species *S. cernuum* out of *S. durra*. Snowden recognises seven varieties of *S. cernuum*, all of which occur in India. Five of these are common crops in the Central Provinces where the centre of this evolution appears to have been. One variety is found in Afghanistan, one in Persia, two in southern Arabia, two in Palestine, and one in the gardens of the curious in Europe since the sixteenth century. It would thus appear that this species filtered through to Europe from India. It has also extended eastwards into Burma where two varieties are recorded.

There appear, however, to have been earlier waves of introduction to Asia than the *S. durra* invasion. These carried the two species *S. dochna* and *S. bicolor* of the subseries *Bicoloria* on the one hand, and the ancestry of the Chinese sorghum, *S. nervosum*, on the other. Both waves led to a wider and more varied dispersal than *S. durra* has, and to the origin of new species in Asia. But in India the more hardy and close-headed grain varieties of *S. durra* seem subsequently to have usurped a supremacy over the vast black cotton soil tracts of India and to have driven the earlier loose-headed inferior-grained

varieties onto the more scattered and less fertile red soils, whereupon species-fragmentation followed. This fragmentation gave rise, *inter alia*, to *S. miliiforme*—a species centred in north-eastern India which is not pre-eminently a sorghum area, as the climate is humid and the rainfall is comparatively heavy—by a process of selection directed to adapting it to special climatic conditions. A parallel case is, perhaps, the evolution of *S. elegans* in the Zanzibar hinterland.

S. splendidum would seem to have arisen by crossing one of the species of the *Bicoloria* subseries with a forerunner of *S. nervosum*. Here again is an example of a species arising to fulfil certain requirements. In this case these are human. It arose in the Indo-Chinese phytogeographic Subregions where a glutinous cereal is in much demand, to supplement, one assumes, the supply of glutinous rice. The species occurs in Burma, Siam and various parts of Malaysia, extending as far east as the Philippines.

Snowden considers that the sorghum which Pliny tells us reached Italy from India in his time was a form of *S. bicolor*; but one asks whether *S. bicolor* and *S. dochna* were already distinct species? It is clear that Pliny regarded it as a cereal grain. We lose sight of sorghum in Italy from his time till A.D. 1305, when Petrus de Crescentiis tells us that it had there a variety of uses—its stems for the walls of temporary shelters and other purposes, its grain for feeding to animals and as a human food in times of scarcity. Almost three hundred years later, the Italian physician, Mattioli, claimed to recognise Pliny's plant in one familiar to himself, though with more faith than evidence. Yet it can be assumed reasonably enough that the cultivation of sorghum in Italy was continuous from Pliny's time to the middle ages. It is extremely probable that Pliny's plant was one with a loose panicle: in support of this assumption, it would seem that the varieties *corymbosum* and *technicum* of *S. dochna*, now known as "broom corns," originated in the Mediterranean Region. The Florence whisk and Venetian whisk are early names for the manufactured products obtained from the tough, lengthened axes of the panicles of these two varieties.

Apart from this development of *S. dochna* in the Mediterranean Region, it is desirable to see whether it is possible to ascertain how the *dochna-bicolor* ancestry fragmented. The problem is complicated by the wide dispersion of varieties of these species by comparatively recent European agency. *S. bicolor* var. *Arduini* was one of the sorghums assembled by the elder Arduini in Italy in the eighteenth century, who probably discovered it in Europe. *S. bicolor* is represented in Burma by two varieties, though neither is confined to this region, one of them extending to China, Japan, and the Hawaiian Islands. The variety *bicolor* is extensively grown in Khorasan and occurs in many unexpected places through India and China. Though Snowden records as in Africa one variety of *S. bicolor* and one of *S. dochna*, no definite indication is given thereby

that that Continent is the ancestral home of these far flung species : there is indeed little indication in any of the varieties which does so : thus we are left with the two alternatives—has the *dochna-bicolor* ancestry lost its hold on its original home in Africa, or did it originate outside Africa ? If the first alternative be deemed acceptable, then one must point to *S. elegans*, which is now grown on the mainland behind Zanzibar, i.e., rather far south for the earliest traders, as the nearest living line.

S. Roxburghii is another loose-panicked sorghum whose migration is of interest. This is the only species of the subseries *Guineënsia* which has travelled right across the continent of Africa and from there has found its way to Asia. Its distribution in the Indian Empire is similar to that of *S. dochna* and *S. bicolor*, but it is more frequently grown than either and in some of its varieties is an excellent cereal. Of its eight varieties, four are entirely African and two are entirely Asiatic ; the other two occur here and there around the Indian Ocean. These last seem in some ways to be of Indian origin, but Snowden writes (p. 67) of them as if they were losing ground in Tanganyika Territory. The variety *hians* occurs in several forms both in Zanzibar and on the mainland, though it would seem to be an Indian variety, and var. *fulvum* occurs as a coastal variety from Siam and both sides of the Bay of Bengal to Madagacsar, the Comoro Islands and the East African coast. The four African varieties clearly belong to that continent and are found principally in the neighbourhood of the big lakes and rivers adjoining Nyasaland and Tanganyika, as if the extra atmospheric humidity was necessary for this species.

The last place in this survey has been reserved for the subseries *Nervosa*, because its principal species—*S. nervosum*—is, in the main, Chinese and thus furthest removed from the country of the origin of the cultivated sorghums. It and its allies, like the far flung *dochna-bicolor* ancestry, supply a case of fragmentation and presumably therefore of early transportation from Africa to Asia. The allies of *S. nervosum* are *S. membranaceum*, *S. basutorum*, *S. melaleucum*, *S. ankolib* and *S. splendidum*. *S. basutorum* is a superior grain species of South Africa ; and for similar reasons *S. melaleucum* is a luxury crop in the Sudan. *S. splendidum* has a glutinous grain and occurs in the Indo-Chinese Sub-regions, while *S. ankolib* is confined to north-east Africa where it is esteemed for its sweet stems and its grain is used for making beer. *S. membranaceum* links the others together geographically. It stretches south to the Transvaal, northwards to the Sudan and the “Horn of Africa” and reaches India in three varieties, while one extends to north China. It is from this last extension that in all probability *S. nervosum* originated, but, if so, it is to be noted that the character of sweet stems, common to the species of this subseries, has been lost.

It would appear that there have been at least two invasions of this subseries into Asia, one of which would seem to be of comparatively

recent date ; for the three varieties of *S. membranaceum* which occur in Bombay and the Central Provinces of India are also recorded from north-eastern Africa. That successive transfers were possible and indeed probable is shown in historical records. The Sabaeans were trading in 300 B.C. to India beyond the Ichthyophagi from below the Horn on the African coast, and they were succeeded by other traders. Chinese records show that subjects of the Roman emperor Marcus Aurelius Antoninus arrived on her shores in A.D. 166. By A.D. 300 the Chinese themselves had voyaged to the shores of Arabia, while ship-building had developed to such an extent that a prince of Tanjore could send a navy to Burma ; and in A.D. 414 the pilgrim Fa-hien sailed from Ceylon to Java in a ship large enough to carry 200 men. It is certain that grain of whatever kind might be available would be shipped at every port of call where this was feasible, and its acceptance for cultivation in a new country would depend on the climate of that coast and the need. Moreover sorghum is not the only crop which would seem to have been carried by sea at a remote time between Asia and Africa. *Sesamum orientale*, judging by the diversified forms which are found in India, Burma and the Far East, may have been transported from Africa at a very early date ; and a closer study of other crops such as the grain pennisetums, *Eleusine coracana*, *Cajanus cajan* and *Vigna unguiculata* (*V. sinensis*), all of which occur in cultivation both in Africa and Asia, may expose a comparable history of transportation.

The order therefore in which sorghums reached Asia would appear to have been somewhat as follows. The original stock which spread through Asia was that of the *dochna-bicolor* subseries. This was followed by some of the stock of the subseries *Nervosa*. At a considerably later date this was followed by the stock of *S. durra* and more recently still by *S. subglabrescens*. Probably *S. Roxburghii*, which, as belonging to the West African subseries *Guineënsia*, would require time to cross the African continent so as to reach the east coast for shipment, was the last to be transported.

Even as late as the nineteenth century, Indian immigrants to the Mascarene Islands and the African coast, have apparently made some interchange of sorghums. Light on this and on many other points has yet to be discovered by local study. Snowden's book supplies the foundations on which we may hope to build.

XVII—A NEW COTONEASTER FROM TIBET.

C. V. B. MARQUAND.

Cotoneaster conspicua Comber in Gard. Chron. ser. 3, 99, 388 (1936), anglice ; affinis *C. microphyllae* Wall., a qua foliis elliptico-oblongis, eis ramulorum hornotinorum ad 9 mm. longis et 3.5 mm. latis, eis annotinorum ad 2 cm. longis et 8 mm. latis, fructu majore differt.—*Cotoneaster conspicua* in Journ. Roy. Hort. Soc. 59, 303 (1934) *nomen*.

A small, spreading *shrub*. *Branches* greyish brown, verrucose. *Branchlets* patulous, at first densely whitish villous, later becoming glabrescent. *Leaves* on the flowering branchlets elliptic-oblong, 6-9 mm. long, 2-3 mm. wide, margin recurved; upper surface sparsely pubescent when young, becoming glabrous and \pm shining in the fruiting stage; lower surface densely appressed-hirsute, in a young state, more sparingly so when mature; midrib impressed above, nerves inconspicuous; petiole 1.5 mm. long, villous; leaves on the barren branchlets similar but larger, up to 2 cm. long and 8 mm. wide. *Stipules* persistent, subulate, scarcely 2 mm. long. *Flowers* solitary, terminating numerous very short spurs on the lateral branchlets. *Receptacle* 3 mm. in diameter, sparsely tomentose outside. *Sepals* triangular, acute, 1.5 mm. long, 1.5 mm. wide, densely appressed-villous. *Petals* widespreading, with a suborbicular blade, 3 mm. long, 4 mm. wide, white, tipped with pink in the bud. *Stamens* 20; filaments subequal, yellowish; anthers subglobose, purple. *Styles* 2, 3 mm. long. *Carpels* 2, glabrous. *Fruit* obovoid or globose, 9 mm. long, 8 mm. in diameter, scarlet (carmine red in dried specimen) with a dull surface; sepals suberect in the fruiting stage. *Pedicel* 1.5 mm. long, pubescent. *Pyrenes* 2, glabrous.

TIBET. Gyala, 2400-2700 m., November 15, 1924 F. Kingdon Ward 6400.

This species was raised by Mr. James Comber from seeds collected by Captain Kingdon Ward in Tibet in 1924. It was exhibited at the Royal Horticultural Society by Lt.-Col. L. C. R. Messel, O.B.E. of Handcross, Sussex, receiving an Award of Merit on October 10, 1933, under the then unpublished name *Cotoneaster conspicua*. The first description of the species was published in June 1936 by Mr. James Comber (l.c.).

No wild specimens being available, the technical description given above is based on cultivated material kindly sent by Mr. Paul Russell of the Bureau of Plant Industry, United States Department of Agriculture, Washington. Mr. Russell states that the plant was raised from seed collected under the above field number by Captain F. Kingdon Ward, who records the following particulars in his published Field Notes, p. 54:—"Shrub, either prostrate on rocks, or erect, up to 3-4 ft. Profusely covered with scarlet berries in winter. Open sunny situations amongst rocks, etc., in the moderately dry regions."

XVIII—MISCELLANEOUS NOTES.

New Year Honours.—We have much pleasure in recording the conferment of the following Honours:—

K.C.M.G.—Mr. F. A. Stockdale, C.M.G., C.B.E., M.A., Agricultural Adviser to the Secretary of State for the Colonies; C.I.E.—Mr. C. G. Trevor, Inspector General of Forests, Indian Forest Service, and Rao Bahadur I.S. Venkataraman, Imperial

Sugarcane Expert, Coimbatore; O.B.E.—Mr. R. H. Locke, Superintendent of Horticultural Operations, New Delhi, and Dr. G. H. Pethybridge, Ph.D., M.A., F.L.S., lately Mycologist and Assistant Director, Plant Pathology Department, Harpenden.

Mrs. Bolus.—We record with pleasure the conferment of the Honorary Degree of Doctor of Science by the University of Cape Town on Mrs. F. Bolus, Curator of the Bolus Herbarium, Kirstenbosch.

Mr. R. A. Dyer.—We learn with pleasure that Mr. R. A. Dyer, Botanist in the Division of Plant Industry, Department of Agriculture, Pretoria, and recently Botanist for South Africa at the Royal Botanic Gardens, Kew, has been awarded the Degree of Doctor of Science at the University of South Africa.

ARTHUR REGINALD HORWOOD.—Members of the staff of the Royal Botanic Gardens, Kew, were deeply grieved to hear of the death of their colleague Mr. A. R. Horwood, F.L.S., on 21 February, at his home at Brentford. He had occupied the position of Temporary Botanist since 1 September 1924 and had worked continuously from that date in the European and Oriental Department of the Herbarium. The interment was at Scraptoft Cemetery, Leicester, on 25 February 1937.

Horwood was born at Leicester on 29 May 1879, the son of the late Rev. F. E. Horwood, M.A., Rector of South Croxton. He was educated at St. John's School, Leatherhead, and by private tutors, with the intention of entering the Indian Civil Service, for which however, he failed to pass the medical examination. For a short time he acted as private tutor and army coach. In 1902 he was appointed to a post at the Leicester Museum and was employed there (apart from home service in Cheshire regiments during the war) till he resigned the Sub-Curatorship in 1922. His work at the Leicester Museum was much appreciated by his chief and others concerned with the development of this well-known provincial museum. During his employment there he published a large number of books and papers on a wide range of botanical subjects, especially on palaeobotany and the British Flora. The best known of these are "Plant Life in the British Isles" (3 vols, 1914-16), "Practical Field Botany" (1914), and "The Outdoor Botanist" (1920).

At Kew, Horwood was mainly employed on the identification of the numerous European and Oriental collections and on rearranging genera of the *Compositae* and other families. In his private time he did a great deal of very diverse journalistic work and also edited the late Dr. J. B. Hurry's book "The Woad Plant" (1930). His most important publication was "The Flora of Leicestershire and Rutland," with the late (3rd) Earl of Gainsborough (1933). This volume of 687 pages contains interesting features new to a county flora.

Horwood made large collections of British plants, some of which are now preserved in the National Museum of Wales, the Leicester Museum, and the Herbarium at Kew. He was of a kindly and generous disposition, but rather determined to do his work according to his own methods which were not always in accord with wider interests. He was extremely industrious and worked very hard in his individualistic way. His correspondence was large and he will be much missed by numerous friends to whom he gave unstinted help and advice. He was twice married and leaves a widow and four sons.—W. B. TURRILL.

MARSHALL AVERY HOWE.—We record with great regret the death on December 24th of Dr. Marshall A. Howe, Ph.D., D.Sc., Director-in-Chief of the New York Botanical Garden. Dr. Howe had been associated with the New York Garden for many years; he joined the scientific staff in 1901 and became Assistant Director in 1923. He succeeded Dr. Merrill as Director on October 1st, 1935.

Dr. Howe was born in Vermont and, having received his training at the University of that State, he held successively the posts of Instructor in Cryptogamic Botany of the University of California (1891-96) and Curator of the Herbarium at Columbia University (1899-1901). His main botanical work concerned the marine algae, of which he was the acknowledged authority in America for many years. He published a large number of floristic papers on the seaweeds of different parts of both North and South America, and specialized on the *Siphoniae* and lime-secreting algae of coral-reefs. He also published many purely systematic works. He was fond of collecting and was appointed a member of the scientific expeditions to Newfoundland, the West Indies and Panama, in the last two of which he was able to study the coral-forming algae in their natural habitats; one result of his investigations was to show that plants played a more important part in reef building than was previously thought.

Horticulture was also a subject of great interest to Marshall Howe. Amongst other groups he had expert knowledge of dahlias, irises and peonies. He took a great interest in the Bronx Park Garden and was President or Vice-President of several horticultural societies. Formerly a President of the New York Academy of Science, he was also President of the Torrey Botanical Club and was for a time editor of "Torreya."

Marshall Howe was a welcome visitor to Kew on several occasions before 1914, and was always ready to assist with critical knowledge and to give help in revising the American algal collections in the Herbarium. Owing to the care and well-balanced judgment which he brought to bear on all his investigations he has left to posterity a large amount of sound published work on the biology and taxonomy of marine algae.

Botanical Magazine.—The first part of vol. 160 was published on February 12th and contains the following plant portraits:—*Corylus colurna* Linn. (t.9469), the Constantinople Hazel, which occurs from S. Hungary to Trans-caspia; *Chasmanthe caffra* (Baker) N. E. Brown (t.9470), a native of S. E. Cape Province and Natal; *Grindelia chiloënsis* (Cornelissen) Cabrera (t.9471), from the Argentine; *Saurauia subspinoso* Anth. (t.9472), from N. E. Upper Burma; *Nierembergia caerulea* Gillies ex Miers (t.9473), formerly known under the name *N. hippomanica*, a native of the Argentine; *Galanthus ikariae* Baker (t.9474), from the island of Ikaria in the Eastern Aegean; *Rhododendron Weyrichii* Maxim. (t.9475), from southern Japan and Quelpaert Island; *Anemone rupicola* Cambess. (t.9476), which is found from Chitral to N. W. Yunnan and Szechwan; *Epidendrum coriifolium* Lindley (t. 9477), found from Guatemala to Peru; *Cotoneaster Cooperi* Marquand var. *microcarpa* Marquand (t. 9478), a native of Bhutan, and *Carmichaelia odorata* Colenso (t. 9479), from New Zealand.

Boissiera.*—A supplement to the well known periodical "Candollea" has appeared. The title "Boissiera" is very apt, commemorating as it does the eminent Genevese traveller and botanist Pierre Edmond Boissier (1810–85), the author of "Flora Orientalis." The periodical of which "Boissiera" is a supplement also bears a personal title commemorating four generations of Genevese botanists—Augustin Pyramus de Candolle (1778–1841), Alphonse (1806–93), Casimir (1836–1918) and Augustin (1868–1920), whose fame and works are too well known to need any elaboration here.

Fascicle I of "Boissiera" is the first of a series of memoirs consisting of papers that for one reason or another cannot be published in "Candollea." They will form an independent series and will appear at irregular intervals. It is very appropriate that this first fascicle should be devoted to the posthumous work of yet another eminent Genevese botanist, namely "Les caractères de la dissymétrie et de l'hétérophylie foliolaires chez les Méliacées à feuilles composées," by John Briquet.

We learn from the introduction by Professor B. P. G. Hochreutiner that Briquet was always interested in the question of symmetry; he started his observations many years ago but, owing to other more pressing demands on his time, he was unable to complete this manuscript. He was continually making fresh observations on the subject, but unfortunately never found time to record his general conclusions on the systematic and phylogenetic value of leaf asymmetry. A chapter is devoted to an historical account of the *Meliaceae* with compound leaves. This is followed by a study of the species, dealing specially with leaf morphology. The leaves are

* "Boissiera." Mémoires du Conservatoire de Botanique et de l'Institut de Botanique Systématique de l'Université de Genève (Supplément de Candollea). Fascicule I. Genève, 1936. Institut de Botanique Systématique de l'Université.

described in great detail and a fund of information is included; therein lies the great value of this unfinished work. It certainly forms an important adjunct to the study of the *Meliaceae* given in De Candolle's Monograph, and as Professor Bugnon remarks (preface, p. 3) it represents not only a complement to the Monograph of *Meliaceae*, but it is a model for monographic study of other families of plants with compound leaves.

In going through the work the reader is impressed by the wealth of detailed observation and careful measurements. This paper is yet another proof of the remarkably versatile mind of the late John Briquet, which is so clearly seen if one glances through the list of his works given by Monsieur Fr. Cavillier in Candollea, 6, pp. iii-vi (1936).

M. L. GREEN.

Old Garden Roses.*—The publication at the present time of this artistically produced book is opportune, as there are indications that an increasing number of gardeners are beginning to take an interest in old-fashioned roses.

The volume is in two sections. The first, dealing with the historical aspect, is a masterly exposition of the subject and one that must have entailed much painstaking research. There are chapters on the rose in Greece, Rome and other countries, and also under Islam, in the Middle Ages and during the Italian Renaissance. In this section there are ten illustrations from famous pictures in which roses are depicted; the colour frontispiece—a Van Huysum—is an exceptionally good reproduction.

In the second half the author describes the chief characteristics of the various groups and of a number of the varieties included in them. Details of their introduction and (where known) the names of the raisers are given. Propagation, planting, pruning and general cultural details are dealt with in an eminently practical manner.

Nineteen beautiful photogravure reproductions of a selection of the old roses are given in this section; also a number of drawings showing a portion of the stem, leaves and buds of several varieties.

The volume is obviously a labour of love and Mr. Bunyard's enthusiasm will certainly stimulate an increased interest in the cultivation of these old favourites.

* By Edward A. Bunyard. Country Life Ltd., London, 1936. Pp. 163: 32 plates in engravure. Price 15s. net.

BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1937 ROYAL BOTANIC GARDENS, KEW

XIX—NEW CHINESE SPECIES OF GENTIANA.

HARRY SMITH (Uppsala).

The following descriptions of ten species, two subspecies and three varieties of Chinese Gentians recognised as new by Dr. Harry Smith are published here in order that the species concerned may be included in "The Gentians of China" by Mr. C. V. B. Marquand (infra, p. 134). With the exception of two species, all of these groups are based on specimens collected by Dr. Harry Smith himself during his travels in China. Numerous other new Chinese Gentians have already been published by Dr. Smith in Handel-Mazzetti's *Symbolae Sinicae*, 7, 950-981 (1936).

The following abbreviations are used for the principal Herbaria in which specimens cited are preserved :— B (Berlin); P (Paris); S (Stockholm); U (Uppsala); W (Wien).

× *Gentiana quaterna* H.Sm., nov. sp. (Sect. *Frigida*); plantae hybridae vel ex hybridisatione derivatae, e grege *Verticillatarum*, praecipue *G. hexaphyllae* relatae.

Perennis; rami floriferi uniflori, 8-13 cm. longi, ut vaginae crebre et minute papilloso-scabriduli. Folia gemmae centralis parum evoluta vel fere deficientia; folia caulina in verticillis quadrifoliis sessilia, 2-3 mm. longe vaginato-connata, acuta-acuminata, suprema approximata calycem subinvolucrancia, 4-6-plo longiora quam lata, 8-14-juga. Flores 6-8-meri, ore (in sicco) 1-3 cm. diametientes, 5-7 cm. longi, lobi fere 1 mm. longe mucronati. Stylus cum ramis stigmatiferis 4-6 mm. longus.

var. *typica* H.Sm., nov. var.

E gemma centrali florendi tempore folia pauca, linearia, vix 1 cm. longa, acuta-acuminata edita. Rami plures, decumbentiascendentes, circiter 8 cm. longi, circiter 11-jugi. Folia caulina sursum majora, marginibus ciliato-scabridula, 2 mm. longe vaginato-connata: ima minuta, ovata, vulgo emarcida, media late linearia, basi breviter attenuata, apice rotundata, apiculata, 8-11 × 3 mm. magna, suprema lineari-lanceolata, basi subattenuata, apice acuta-acuminata, mucronulata, ad 14 × 2.5 mm. magna. Flores 6- (rarius 5- vel 7-) meri, 5-6 cm. longi, laete caerulei. Calycis tubus intense rubro-tinctus, circiter 11 mm. longus; lobi lanceolati, acuminato-acuti, 8-10 mm. longi, in media parte 2 mm. lati. Corollae tubus supra medium inflatus, ore (in sicco) vix 2.5 cm. diametro; lobi

ovati, acuminato-acuti, 5 mm. longi et 6-7 mm. lati, 0.7 mm. longè mucronati; plicae subtriangulares, denticulatae, vix 2 mm. longi, ad 8 mm. latae. *Stamina* loco insertionis in tubum inter se circiter 5 mm. longè connata, antheris 3.5 mm. longis, pollen ad 65 pro centum fertile producentibus. *Stylis* cum ramis stigmatiferis circiter 5 mm. longus.

Ut *G. tetraphylla* Kusn. foliis quaternis, flore 6-7-mero distincta. Quae species tamen foliis gemmae nondum evolutis, foliis caulibus obtusis subapiculatis (nec acuminato-acutis, mucronulatis) multo brevioribus crassiusculis in marginibus cartilagineo-subglabris (nec ciliato-scabris), polline omnino fertili styloque subnullo longè distat.

SZE-CH'UAN REG. BOR.-OCCID.: Merge, mont. occid. in prato alpino c. 3600 m., 31. VIII. 1922, *Smith* 4249 (U, typus); Tsipula in prato alpino c. 4100 m., 26. VIII. 1922, *Smith* 4210 (U).

To judge from the occurrence of quite similar plants in different areas and from the rather high percentage of fertile pollen (c.65%) this form may be considered to represent a race which is segregating from some hybrid population, and is on its way to independence.

G. quaterna and its varieties must not be confounded with *G. tetraphylla* Kusn., which is an established species, well distinguished by marked characters, and with fully fertile pollen.

var. *octoloba* H. Sm., nov. var.

A typo distat: ramis floriferis ad 13 cm. longis 10-11-nodibus; foliis gemmae paucis lanceolato-linearibus subacutis ad 25×4 mm. magnis, foliis caulinis imis minimis ovatis, supremis subapproximatis internodiis multo longioribus calycem subamplectentibus lineari-obovatis-lanceolato-linearibus ad 20×3.5 mm. magnis, apice in foliis intermediis obtuso in supremis acuto; floribus 8-meris 5-6 cm. longis ore (in sicco) 3 cm. diametro intense caeruleis et extra in tubo obscuro-vittatis; calycis lobis suberectis lineari-lanceolatis acutis subapiculatis 12-16 mm. longis in media parte 1.5-2.5 mm. latis basi ± distincte attenuatis; corollae lobis ovato-triangularibus 4-5 mm. longis et 6 mm. latis 0.7 mm. longè mucronatis; plicis subtriangularibus dentatis 3-4 mm. longis et 7 mm. latis; staminum filamentis liberis 10 mm. longis, antheris 2.5 mm. longis pollen vix 10 pro centum fertile producentibus.

SZE-CH'UAN REG. BOR.-OCCID.: Tsipula in prato alpino, c. 4000 m., 26. VIII. 1922, *Smith* 4208 (U, typus).

Only one specimen was found. The poor fertility of the pollen—barely 10%—seems to confirm the field note, in which the plant was supposed to be a hybrid between species which have turned out to be *G. Veitchiorum* and *G. hexaphylla* var. *septemloba*. The former is indicated by the development of rosette leaves and by the middle cauline leaves being obtuse, the latter by the form of the cauline leaves, by the concentration of the fully developed ones towards the calyx, by their intensely scabrid margin and by the polymeric flowers.

subsp. **sankarensis** *H.Sm.*, nov. subsp.

A typo distat : ramis floriferis 4-7 cm. longis ascendenti-erectis circiter 11-nodibus ; foliis gemmae non evolutis, caulinis mediis late linearibus apice rotundatis apiculatis ad $10 \times 2.5-3$ mm. magnis superioribus lanceolato-linearibus acutis ad $11 \times 2-2.2$ mm. magnis ; corollae tubo angusto, ore (in sicco) 1-1.3 cm. diametro, superiore parte tubi paullum inflata, lobis late ovatis acutis mucronatis, plicis triangularibus lobis subduplo brevioribus ; antheris 2 mm. longis pollen 5-10 pro centum fertile producentibus ; stylo cum ramis stigmatiferis 4-5 mm. longo.

SZE-CH'UAN REG. BOR.-OCCID.: Sankar-vou-mâ, in duriprato, c. 4000 m., 5. IX. 1922, *Smith* 4750 (U, typus).

subsp. **longiflora** *H.Sm.*, nov. subsp.

A typo distat : ramis floriferis ad 9 cm. longis ad 14-nodibus papilloso-glandulosis ; foliis caulinis mediis subobovato-lanceolatis acutis circiter $10 \times 2-2.5$ mm. magnis, supremis linearibus acuminato-acutis 15×2 mm. magnis ; floribus 7-meris 6-7 cm. longis ; calycis tubo circiter 15 mm., lobis lineari-lanceolatis acuminatis 8-10 mm. longis ; corollae tubo superiore parte subinflato, ore 2.5 cm. diametro, lobis late ovatis apice acuminatis fere 1 mm. longe mucronatis, plicis triangularibus integris vel crenulatis acutis 4 mm. longis et 6 mm. latis ; antheris 3 mm. longis pollen ad 60 pro centum fertile producentibus.

SZE-CH'UAN REG. BOR.: Huang-chen-kuan in prato, c. 3300 m., 19.VIII.1922, *Smith* 3826 (U).

This form is probably not a primary hybrid but a later hybridogen segregation. The different individuals are uniform, and the pollen fairly fertile. No other species was found in the same locality, according to the field note, which statement yet hardly can be very reliable, as the flowering season of these plants at the date of collection was in its first beginning. Characters of *G. hexaphylla* and *G. Farreri* can be recognised.

The three subspecies and varieties are distinct between themselves. But I have referred them to *G. quaterna*, as this name does not cover a distinct species, but is meant to include hybrids or hybrid segregations of a certain 4-verticillate type, originating from not ascertained parents, on the one side belonging to *G. hexaphylla* or nearly allied, on the other to some species of the *ornata*-group.

Gentiana viatrix *H.Sm.*, nov. sp. (Sect. *Frigida*).

Perennis ; gemma centralis stoloniformiter 2-4 cm. prolongata, sursum radicans. Infra eam rami uniflori, ascendentes-erecti, 8-11-nodes, 3-5 cm. longi editi. Folia caulina rite 5-verticillata. Flores 5- (raro 6-) meri, sessiles, angusti, sursum sublaete violaceo-caerulei, in tubo flavescentes, atro-caeruleo-vittati et parum obscuropunctati.

Folia caulis stoloniformis opposita, squamiformia, limbo vix vel non evoluto, 4-7-juga, paribus 2-3 supremis majoribus gemmam

involucrantibus ; folia caulina crassiuscula, 2 mm. longe vaginato-connata, internodiis longiora vel raro iis subaequilonga, sursum sensim accrescentia et approximata, obovata-linear-obovata, sub-acuta-acuta, suprema mucronulata, in marginibus levissime scabridula, 5-8×1.7-2.4 mm. magna. *Calycis* tubus fere cylindraceus, 7 mm. longus ; lobi obovati-linearilanceolati, breviter acuti, mucronulati, 4×1-1.5 mm. magni. *Corollae* tubus angustus, medio parum inflatus, ore (in sicco) vix 1 cm. diametro ; lobi 1.5 mm. longe mucronati, late triangulares, minute denticulati, sine mucrone 2.5 mm. longi et circiter 6 mm. lati ; plicae oblique truncatae, erosulae, circiter 6 mm. latae, cum lobo suo dextro continuae. *Stamina* tubo 18 mm. supra basin inserta, filamentis liberis 5 mm. longis deorsum subabrupte incrassatis (in sicco "late alatis" visis) loco insertionis 2-3 mm. longe inter se connatis. *Ovarium* submatum 12 mm. stipitatum, ovoideo-ellipticum, 10×4.5 mm. magnum, apice acutum, in stylum filiforme 5 mm. longum attenuatum, ramis stigmatiferis linearibus demum recurvatis circiter 2 mm. longis. *Semina* subovoidea, irregulariter angularia, 1×0.7 mm. magna, testa albo-lamellosa-areolata.

Ex affinitate *G. Arethusae* Burkill, a qua distat : habitu multo minore, foliis subobovatis (nec linearibus acutissimis), caulibus circiter 10- (nec plus quam 20-) nodibus, corollae lobis 1.5 (nec 3) mm. longe caudatis, stylo filiformi 5 mm. longo (nec subnullo). *G. hexaphylla* inter alia stylo subnullo distincta.

SZE-CH'UAN REG. BOR.-OCCID. : Matang, mont. bor.-orient. in prato alpino aperto, c. 4800 m., 13. IX. 1922, *Smith* 4345 (U, typus).

The name refers to the peculiar habit of this plant, and also of *G. Arethusae*, to remove itself a little distance yearly.

***Gentiana hexaphylla* Maxim. var. septemloba H.Sm., nov. var. (Sect. *Frigida*).**

Ad *G. suboccultam* Marquand vergens, a typo distat ; planta majore, foliorum verticillis supremis approximatis calycem involu- crantibus ; flore 7- (raro 6-) mero majore c. 5 cm. longo, corollae tubo ampliore, ore (in sicco) 1.5 cm. vel ultra diametiente.

SZE-CH'UAN BOR.-OCCID. : Tsipula in prato alpino, c. 4100 m., 26.VIII.1922, *Smith* 4209 (U, typus) ; ibidem, 2.VIII.1922, *Smith* 4116 (U) ; ibidem, 5.VIII.1922, *Smith* 2963 (U, forma ad *G. hexaphyllam* recedens).

The variety *septemloba* approaches *G. subocculta* Marquand. Compared with typical *G. hexaphylla*, the variety is more robust, with flowering branches up to 15 cm. long. The upper cauline leaves are longer, up to 15 mm. in length by 3 mm. broad. The apex of the leaves and calyx-lobes is *acute*, apiculated. The flowers are 5 cm. long, with a much wider tube, at the mouth measuring 1.5-2 cm. across (when dried). The variety looks distinct in the type specimen, but is not sharply delimited, being connected with typical *G. hexaphylla* by intermediate forms.

In *G. hexaphylla* the number of leaves in the whorls and the number of lobes to the corolla is not so regular as is stated in Maximovicz's diagnosis. The species is usually 6-merous, but 5- or 7-merous specimens are fairly common. *G. hexaphylla* is best recognised by the following characters : ascending flowering branches, hardly exceeding 8 cm. in length ; upper cauline leaves linear-obovate, up to 10×3.2 mm. in size. Apex of leaves and calyx lobes rounded and very shortly apiculate. The flowers are about 4 cm. long and, though inflated at the middle, rather narrow, the corolla tube being usually not more than 1 cm. wide at the mouth (when dried); the corolla-lobes varying from broadly ovate to triangular, apex long mucronate (1 mm.).

***Gentiana altorum* H. Sm., nov. sp. (Sect. *Frigida*).**

Perennis, humilis ; folia rosularia subevoluta ; rami floriferi, infra gemmam centralem orti, pauci-plures, ascendentes-erecti, glabrescentes vel \pm sparsim papilloso, 7-9-nodes, 3-8 cm. longi. Flos terminalis sessilis, 3-4.5 cm. longus, subinflatus, sublaete caeruleus, extra in tubo vittatus.

Folia rosularia e basi 3-4 mm. lata subtriangularia, 5-10 mm. longa, in marginibus leviter scabridula ; folia caulina opposita, crassiuscula, vaginato-connata, in vaginis \pm papillosa, marginibus inconspicue scabridulis, ima minora, ovata, acuta, superiora gradatim accrescentia, ovato-linearia, subacuta, ad 13×4 mm. magna, medio vel infra medium folii latiora. *Calycis* tubus obconoideus, 9-11 mm. longus, ore 4-5 mm. diametro ; lobi erecti, lanceolato-lineares, 4-8 mm. longi et 1-2 mm. lati. *Corollae* tubus paullum inflatus, ore (in sicco) 12-16 mm. diametiente ; lobi ovato-triangularis, mucronulati, circiter 4 mm. longi et 5-6 mm. lati ; plicae subtriangulares, integrae vel dentatae, lobis subduplo breviores et iis aequilatae. *Stamina* tubo 15 mm. alte inserta, filamentis liberis circiter 9 mm. longis deorsum modice incrassatis inter se liberis, antheris 2-2.5 mm. longis. *Ovarium* 14 mm. longe stipitatum, stylo cum ramis stigmatiferis 4.5 mm. longo. *Capsula* longe exserta, 14 mm. longa et 5 mm. lata, testa seminum hexagonaliter areolata.

Affinis *G. Veitchiorum* Hemsl., a qua distat : planta glabriore et omnibus partibus minoribus, summa latitudine foliorum semper infra medium folii, filamentis staminum inter se liberis, corollae latioris tubo ampliore subinflato.

SIKANG : Taofu distr.: Zungkong La, in prato alpino, 4200 m., 20. IX.1934, *Smith* 12537 (U, typus) ; ibidem, 4200-4500 m., *Smith* 12535, 12534, 12536, 13927, 13931, 13932 ; Haitzeshan, 4500 m., 31. VIII.1934, *Smith* 11699 ; Mt. Yara, N.W. glacier valley, 4400 m., 29. VIII.1934, *Smith* 11654 ; inter Bejü et Batang, Mäla pass, 4560 m., 13. VIII.1914, *Limpricht* 2164 (Breslau, typica, sub nomine *G. ornata*) ; inter Batang et Litang, Ro-ssä-la, pass between Taschu and Rati, 5000 m., 23. VIII.1914, *Limpricht* 2283 (Breslau, sub nomine *G.*

ornata); between Litang and Ranong, Ngara pass, 5000 m., 26.VIII.1914, *Limpricht* 2300 (Breslau, sub nomine *G. ornata*.—Ut praecedens a typo paullum distat, corollae tubo angustiore non inflato ad *G. Veitchiorum* accedens).

***Gentiana pseudodecumbens* H. Sm., nov. sp. (Sect. *Aptera*).**

Perennis; radix valida, verticalis, vulgo uniceps, monopodium inferne residuis vetustis filamentosis vestitum emittens. Monopodium foliis subrosulatis terminatum, ex axillis infernis ramos floriferos cauliformes singulum vel paucos ascendentes-suberectos 10–20 cm. longos vulgo 4-nodes edens. Flores singuli vel saepe terni, in apicibus caulibus ramorumque axillarium sessiles vel pedicellati, 3.5–4.5 cm. longi, subanguste infundibulares, intus intense caerulei, extra cyaneo-virescentes.

Folia rosularia lineari-lanceolata, 7–24×0.7–1.8 cm. magna, trinervia, marginibus minutissime scabridula; folia caulina sursum decrescentia, in bracteas angustas floribus subaequilongas trans-euntia, linearia, ad 11×0.6 cm. magna. *Calyx* corolla duplo, interdum triplo, brevior, 5-nervatus, vulgo ad dimidium spathaceo-fissus, 12–18 mm. longus, lobis 5 lineari-acuminatis 5–11 mm. longis. *Corollae* lobi late ovati, basi subattenuati, apice subobtusiusculi vel interdum fere acuti, ad 7×7 mm. magni; plicae lobis duplo vel triplo breviores, ad 5 mm. latae, triangulares, apice acutae, integrae vel leviter bifidae. *Stamina* medio tubi inserta, filamentis liberis 10–12 mm. longis, antheris 2–2.5 mm. longis. *Ovarium* sessile. *Capsula* matura 25–31×5 mm. magna, basi subattenuata, apice acuta, in stylum fere 3 mm. longum attenuata, stigmatibus brevibus subapplanatis patentibus. *Semina* ovali-ovoidea, 1.4–1.8×0.6–0.8 mm. magna, testa albescenti-straminea minutissime reticulato-foveolata.

Affinis *G. decumbenti* L., a qua praesertim distat: flore majore, calycis lobis multoties longioribus semper 5, plicis acutis majoribus, capsula non stipitata.

CHILI: Hsiao-wu-tai-shan, Tien-lin-ssü in colle aprico c. 1600 m., 21.IX.1921, *Smith* 171 (U, typus); ibidem, 7.VIII.1917, *Limpricht* 3041 (W, S); inter Tao-lai-shui et Kuo-che-wai, c. 1800 m., 15.IX.1921, *Smith* 1040 (U); Ta-miao in pass Ta-ling, 2.VIII.1912, *Limpricht* 593 (W, S).

MONGOLIA SINENSIS: Tabool, 13.VIII.1920, *E. Rosenius* 1070 (S); inter Tabool et Hallong-osso, 21.VII.1919, *J. G. Andersson* 312a, 312b (S).

***Gentiana oligophylla* H. Sm., sp. nov. (Sect. *Chondrophylla*).**

Planta perennis (?), omnino glabra, gracilis, erecta, ad 17 cm. alta, 6-nodosa, media et superiore parte dichotome ramosa, ramis 2–7 suberectis elongatis unifloris, floribus erectis albo-caeruleis (?) ad 9 mm. longis longe pedicellatis.

Folia rosularia ovato-lanceolata, 9–15 mm. longa, ad 5 mm. lata, breviter petiolata; folia caulina internodiis multoties breviora,

lineari-lanceolata, patentia, recurvato-arcuata, inter se subaequimagna, circiter 5 mm. longa, margine minutissime asperula, mucronulata. *Calycis* 4 mm. longi tubus campanulatus; lobi tubo aequilongi, aciculares, emucronati, sinubus latis rotundatis. *Corollae* tubus 7 mm. longus, fere campanulatus; lobi obtusi, rotundati, media parte latissimi, 2-2.5 mm. longi et 2.5 mm. lati; plicae 1.5-2 mm. longae, 2-2.5 mm. latae, lateribus rectis, parte $\frac{1}{3}$ superiore in fimbrias 10-14 clavatas dissolutae. *Stamina* tubo 2 mm. supra basin affixa, filamentis filiformibus 3 mm. et antheris 0.7 mm. longis. *Capsula* semimatura rotundato-oblonga, circum anguste alata, 3.5×2.5 mm. magna, stylo subnullo, stigmatibus recurvatis 1 mm. longis. *Ovula* magna, circiter 20. *Capsula* matura et semina non visa.

HUPEH OCCID.: sine loc. ind., VI. 1910, *Wilson* 4662 (B).

Species *G. panthaicae* Burk. affinis, sed habitu pergracili valde dissimilis, corollae lobis rotundatis, plicarum fimbriis clavatis, capsula subrotundata et stylo subnullo differt.—*G. delicatula* Hance nom. in sched. herb. Paris. (specimen unicum pauperum vidi) persimilis tamen species aliena est et a *G. oligophylla* distat: flore circiter 10 mm. longo, calycis lobis mucronulatis, sinubus angustis, corollae lobis ovato-ovalibus 3 mm. longis 2.4 mm. latis obtusis, plicis 2.5 mm. longis et 2 mm. latis ad $\frac{1}{2}$ partem bifidis apicibus circiter 1 mm. longe fimbriatis, fimbriis filiformibus, staminibus paullo supra medium tubi affixis, ovario seminato fere exalato oblongo 3.5×1.6 mm. magno ovula 15-20 tenente, stylo brevi distincto.

***Gentiana inconspicua* H. Sm., nov. sp. (Sect. *Chondrophylla*).**

Planta annua, subcrassula, subflaccida, pumila, e basi pauciramosa, ramis ad 3.5 cm. longis 5-nodibus di- vel trichotomis decumbentibus minutissime albo-papillosis. Flores solitarii, pedicellati, caerulei, angusti, ad 10 mm. longi.

Folia rosularia—si evoluta—ovata, subacuta, 10×7 mm. magna, mucronata, in marginibus—aetate interdum glabrescentibus—dense scabro-ciliata; folia caulina recurvato-patentia, in petiolum brevem attenuata, rotundato-obovata, subacuta, mucronata, in marginibus et saepe subtus in nervo mediano ciliata, 3-7 mm. longa, 2-4 mm. lata. *Calycis* angusti tubus ad 4 mm. longus; lobi 1.5 mm. lata. *Calycis* angusti tubus ad 4 mm. longus; lobi 1.5 mm. longi, e basi 0.7 mm. lata acuminati, mucronulati, marginibus et in nervo mediano papillosi. *Corollae* angustae tubus ad 8 mm. longus; lobi vix 2 mm. longi, anguste ovato-triangulares, acuti; plicae breves, oblique triangulares, subacutae, 0.5 mm. longae et 1.5 mm. latae. *Stamina* inaequilonga, tubo circiter 3 mm. supra basin affixa, filamentis liberis 2.8-3.5 mm. longis, antheris oblongo-rotundatis 0.6 mm. longis. *Capsula* obovato-oblonga, 4.5×2.5 mm. magna, angustissime alata, stylo distincto brevissimo, stigmatibus recurvatis 1 mm. longis. *Ovula* submatura magna, pauca (pro capsula 6-9), subtrigona, 2×0.9 mm. magna, testa levissime reticulato-striatula.

Affinis *G. flexicauli*, sed omnibus partibus multo minoribus, foliorum et loborum calycis marginibus ciliatis inter alia distat.

SZE-CH'UAN BOR.: Dongrergo in Rhododendretis, 4100–4300 m., 20.VII.1922, *Smith* 3903 (U, typus); ibidem, in prato alpino fruticoso, c. 4600 m., 21.VII.1922, *Smith* 3338 (U); ibidem, ad rivulum in Rhododendretis, 4100–4300 m., 20.VII.1922, *Smith* 2979 (U ; a typo distat : floribus minus angustis, stria papillosa loborum calycis in tubum decurrente, corollae plicis longioribus, anguste triangularibus, lobis $\frac{1}{4}$ solum brevioribus.—Forma duobus tantum speciminibus visis non satis nota).

***Gentiana heleonastes* H. Sm., nov. sp. (Sect. *Chondrophylla*).**

Planta annua, glabra, tenuis, e basi pluriramosa, ramis simplicibus elongatis 6–8-nodibus inter se aequilongis (4–) 9–17 cm. longis unifloris. Flores erecti, 0.5–1.5 cm. longe pedicellati, 12–18 mm. longi, intus et in plicis albi, extra caerulescentes.

Folia rosularia parva, obovata-ovata, mucronulata, ad 6 mm. longa ; folia caulina stricte erecta (caulibus adpressa), internodiis 2–4-plo breviora (infimis brevioribus exceptis), lineari-acicularia, tenuia, mucronulata, ad 10 mm. longa et 1 mm. lata, ad $\frac{1}{2}$ partem vaginato-connata. *Calycis* tubus cylindraceo-obconicus, 6–7 mm. longus ; lobi circiter 2.5 mm. longi, e basi vix 1 mm. lata acuminati. *Corollae* tubus circiter 14 mm. longus ; lobi ovati, vulgo paululum obliqui, acuti, denticulati, 3–3.5 mm. longi et 2–2.5 mm. lati ; plicae subquadratae, lobis $\frac{1}{3}$ breviores, apicibus recte truncatae, laciniatae. *Stamina* tubo 6–7 mm. supra basin affixa, filamentis subinaequilongis gracillimis 2.5–3.5 mm. longis antheris 0.8 mm. longis. *Capsula* oblongo-obovata, circum anguste alata, 7×3.5 mm. magna, stylo 1 mm. longo coronata, stigmatibus recurvatis 1.5 mm. longis. *Semina* oblonga, subangularia, 1.5×0.5 mm. magna, testa albescente levissime striato-reticulata.

Species habitu insignis, *G. Prattii* Kusn., mihi non visae, plicis subquadratis similis, tamen calycis lobis ecarinatis, foliis angustissimis glabris (nec oblongis-ovatis margine ciliatis) distat. A *G. Forrestii* Marquand et *G. pallescente* H. Sm. inter alia plicarum foliorumque forma distincta.

SZE-CH'UAN BOR.-OCC.: Tsipula in uliginosis graminosis, c. 4000 m., 5.VIII. 1922, *Smith* 4192 (typus).

***Gentiana Licentii* H. Sm., nov. sp. (Sect. *Chondrophylla*).**

Planta annua, omnino glabra, caule infra rosulam debili decumbente ad 10 cm. prolongato ; rosula caules plures unifloros simplices 2–4 cm. longos emittens. Flores caerulei, erecti, 18–20 cm. longi.

Folia rosularia pauca (4–6), ovato- vel obovato-rotundata, ad 2.4×1.6 cm. magna, obtusa, subapiculata ; folia caulina 2–3-juga, infima ± cuneatim spatulata, superiora linearia, carina dorsali et marginibus cartilagineo-albo-marginata, mucronulata, 7–9 mm. longa. *Flores* 5-meri. *Calycis* tubus anguste obconicus, 7–8 mm.

longus, basi 1.5, ore circiter 4 mm. diametro ; lobi acuti, anguste triangulares, vix 2 mm. longi, basi circiter 1.2 mm. lati, membrana intercalycina circiter 0.5 mm. lata intercepti, anguste albo-marginati, mucronulati, dorso carina cartilaginea lateraliter crenulata et in tubum decurrente instructi. *Corollae* caeruleae extra virescentis tubus 16 mm. longus, ore circiter 6 mm. diametro ; lobi rotundato-ovati, subapiculati, circiter 2.5 mm. longi et lati ; plicae triangulares, integrae vel leviter bifidae, subacutae, fere 2 mm. longae et latae. *Stamina* medio tubo affixa, fauces non attingentia, filamentis gracilibus 3 mm. longis. *Capsula* obovata, alata, circiter 6 mm. longa et 4 mm. lata, stylo distincto fere 1 mm. longo coronata. *Semina* submatura triquetra, 1.4×0.5 mm. magna, testa laevi brunnescente.

Species ex affinitate *G. Thunbergii*, a qua distat : caule infra rosulam valde elongato, foliis rosulariis \pm rotundatis obtusis (nec longe acuminatis), floribus minoribus, calycis lobis tubo 4-plo brevioribus (nec ei subaequilongis).

KANSU AUSTRO-ORIENT.: vers Hoan-kia-ho, 17.IV.1919, E. Licent 5051 (U, W.).

***Gentiana aphrosperma* H. Sm., nov. sp. (Sect. *Chondrophylla*).**

(Specimen unicum a me visum.) Planta annua, omnino glabra. Caulis e basi simplex, vix 2 cm. longus, ramum singulum gerens. Flores in apicibus solitarii, sessiles, 20 mm. longi, tandem ad 25 mm. crescentes.

Folia rosularia parva, marcescentia, ovato-spathulata ; caulina 4-juga, sursum paullo majora, ad 7 mm. longa, dorso valde alato-carinata, laminis rotundato-ovatis ad 4 mm. latis in petiolum latum contractis, petiolis basi in vaginam circiter 2 mm. longam caulem amplectentem connatis. *Calycis* tubus 16 mm. longus, subcylindraceus, ore 3.5 mm. diametro ; lobi erecti, subacuti, circiter 2 mm. lati, valde alato-carinati, carina aliformi foliacea superne ad 1.2 mm. alta rubro-tincta in majorem partem tubi decurrente. *Corollae* tubus calycem 2-3 mm. superans ; lobi ovati, fere 3 mm. longi et lati ; plicae obliquae (i.e. latere sinistro, e centro floris viso, lobo altius adnato), rotundato-ovatae, lobis $1/4$ breviores, apice denticulato-laciniatae. *Stamina* aequilonga, fauces superantia, supra medium tubi affixa, filamentis filiformibus, antheris 1.1 mm. longis. *Capsula* oblongo-linearis, exalata, basi rotundata, apice subacuta, 16 mm. longa et 4 mm. lata, stylo 1 mm., stigmatibus recurvatis 1 mm. longis. *Semina* 2×1 mm. magna, testa cellulis magnis inflatis spongiosa longitudinaliter subalato-sulcata.

Species insignis, a ceteris *Chondrophyllis* characteribus foliorum, calycis, corollae et seminum valde aliena.

SZE-CH'UAN BOR.: Hsioeh-shan in prato alpino c. 4300 m., 11.VIII. 1922, *Smith* 3420 (U, typus).

***Gentiana flexicaulis* H. Sm., nov. sp. (Sect. *Chondrophylla*).**

Planta annua, omnino glabra, in vaginis tantum parce papillosa, subcrassula, flaccida, basi simplex vel pauciramosa. Caules et rami

5-13 cm. longi, \pm decumbentes, parce di- vel trichotomi, flexuosi. Flores singuli, longe pedicellati, caerulei, circiter 16 mm. longi.

Folia rosularia ovalia-ovata, inconspicue mucronulata, ad 14×8 mm. magna; folia caulina circiter 5-juga, internodiis 2-5-plo breviora, petiolata vel subpetiolata, petiolis breviter vaginato-connatis, vagina leviter albo-papillosa, laminis rotundatis-rotundato-lanceolatis acutis submucronulatis patentibus 5-10 mm. longis. *Calycis* tubus 5-6 mm. longus, anguste obconicus; lobi erecti, e basi circiter 0.6 mm. lata acuminati, ad 2 mm. longi, sinubus latis, membrana intercalycina horizontaliter expansa. *Corollae* tubus 12-14 mm. longus; lobi ovati, obtusi, 1.5-2 mm. longi; plicae integrae, lobis conformes sed $1/3$ breviores. *Stamina* tubo 4 mm. supra basin adnata, filamentis inaequilongis 4.5-6.5 mm. longis, antheris 0.7 mm. longis. *Capsula* rotundato-ovalis, 4.5×3.5 mm. magna, circum late alata, stylo distincto brevi, stigmatibus recurvatis; capsula matura e corolla longissime excedens. *Semina* triquetra, ad 2×1.1 mm. magna, testa sublaevi stramineo-brunnescente.

Ex affinitate *G. bellae* Franch., a qua inter alia differt: habitu flaccida et decumbente, sinubus inter lobos calycis latis nec acuto-angustis, membrana intercalycina horizontaliter expansa, stylo brevi nec elongato, seminum testa sublaevi (nec albo-cartilaginea striato-reticulata).

SZE-CH'UAN BOR.-OCC.: Sankar-vou-mâ, in silva muscosa coniferarum, c. 3800 m., 9.IX.1922, *Smith* 4343 (typus); Matang, mont. bor.-orient., in prato alpino subhumido c. 4600 m., 15.IX.1922, *Smith* 4420.

XX—THE GENTIANAS OF CHINA. C. V. B. MARQUAND.

INTRODUCTION.

The most recent monograph of the genus is Kusnezow's "Subgenus *Eugentiana* Kusnez. generis *Gentiana* Tournef.,"* published in Act. Hort. Petrop. 15, 1-507 (1896-1904). As stated in the preface, this monograph is almost a verbatim translation of the original Russian text † of the work, published in 1894. Hence it does not include 13 new species and 3 new varieties described by Franchet in Bull. Soc. Bot. France, 43, 483-495 (1896). Since that date a great many additions have been made to the gentian flora of China, so that whereas Kusnezow described only 162 species from the entire world, the present revision includes 184 species from China alone, two-thirds of them having been described since Kusnezow's account.

The genus *Gentiana*, as delimited in the present revision, corresponds to subgen. *Eugentiana* Kusnez., with the addition of the two

* Cited in this paper as "Kusnez. Monogr."

† Kusnetzoff, N., Die Untergattung *Eugentiana* Kusnetz. der Gattung *Gentiana* Tournef. Systematische, morphologische und geographische Abhandlung. gr. 8° IX. pp. 531. VII Tabellen. 1 Tafel mit Abbildungen und 4 Kartogramme. St. Petersburg 1894 (Russisch).—Vide Bot. Centralblatt, 63, 135-140 (1895).

sections *Dipterospermum* (C. B. Clarke) Marquand and *Tripterospermum* (C. B. Clarke) Marquand, which up to 1931 were included in a separate genus, *Crawfurdia* Wall. *Crawfurdia* is now reduced to synonymy, its third section, *Pterygocalyx*, having been assigned by the writer to the genus *Gentianella* Moench (1794), which Kusnezow treated as a subgenus of *Gentiana* (see Kew Bull. 1931, 69).

Only seven of the ten sections of *Eugentiana* recognized by Kusnezow are represented in China, those absent being *Coelanthé* (middle and south Europe, Asia Minor, Kamchatka), *Thylacites* (mountains of middle and south Europe), and *Cyclostigma* (Europe, Caucasus, Siberia, Arctic Regions). The two largest sections in China are *Chondrophylla* (73 species) and *Frigida* (53 species). The relatively large section *Pneumonanthe*, which is predominantly American, is represented in China by a single species, *G. scabra* Bunge, whilst *Isomeria* is also represented by one species only, the four others being Himalayan. The section *Otophora* (4 species) is endemic in a small area in S.W. China and adjacent parts of S.E. Tibet and N.E. Upper Burma.

The greatly increased number of species now known makes their differentiation more difficult, and some are not easily classified owing to insufficient material, mature capsule and seeds, for example, being available in relatively few cases.

The distinction between Sect. *Dipterospermum* and Sect. *Tripterospermum* is a very well marked one, based on the seed characters, but the subsidiary characters visible in the flowering stage are not nearly so constant or so reliable. It is unfortunate that most specimens are collected in the flowering stage only, for identification is accordingly very difficult in some such cases.

Among the more important characters employed in diagnosing the species are:—

(1) The seeds; (2) the shape of the corolla-tube, lobes and plicae; (3) the stamens, their attachment, the shape of the anthers and their height in the corolla-tube, and the filaments (whether winged or not); (4) the leaves; (5) the branching of the plant and its duration.

There is a strong probability that hybridization has been one of the main factors responsible for the origin of the numerous apparently distinct "forms" now known in this genus. In the absence of direct proof, the monographer is faced with the choice of describing an immense number of microspecies, known in many instances only from single specimens, or of reducing them to a small number of "Linnaean" species, no intermediate course being practicable. Of these alternatives, the latter has been adopted here as being more convenient in the present state of our knowledge. No portion of the genus presents more difficulty than the series *Ornatae* of sect. *Frigida*. Here, from the collectors' observations in the field, there is strong evidence for the existence of natural hybrids, and an exceptional profusion of forms is found in various parts of S.E. Tibet, Yunnan, Szechwan, and the N.E. Upper Burma borders.

The large number of species of *Gentiana* found in South-West China is probably due to the fact that this area is the meeting-point of several Asiatic floras, namely the Himalayan, Tibetan, Northern Asiatic and Northern Burmese floras. Chief among these is the Himalayan, with which the Chinese gentian flora has numerous species in common, particularly in the sections *Frigida* and *Chondrophylla*. In other cases, pairs of representative species are known, one in the Himalaya and the other in South-West China, e.g. *G. tubiflora* and *G. filistyla*. This close relationship between the two floras is explained by the fact that the Himalayan chain can be traced east of the river Tsangpo into China, though it is now obscured by the river gorges in North-West Yunnan which have cut through it from north to south (Kingdon Ward in Journ. Linn. Soc., Bot. 50, 239-265 : 1935).

In North China the widely extended arid North Asiatic flora is the principal element, and it is here that the section *Aptera* is most largely represented. In the intensively cultivated area of Central and Eastern China, originally covered to a large extent by forests, long since felled by the inhabitants, several species of sect. *Chondrophylla*, e.g. *G. Yokusai* and *G. Loureirii*, are rice-field weeds occurring also in other parts of Asia. In the extreme south there is found a subtropical flora, having affinities with those of Burma and Indo-China. From the above account it will be seen that the flora of China is by no means homogeneous. In no case does any part of the political boundary correspond with a botanical division of the Asiatic flora. Moreover, as the western boundary of China is ill-defined and has changed considerably from time to time, the area covered by "China" has been interpreted in its widest sense in the present work, and accordingly includes a considerable portion of territory on the borders of southern and eastern Tibet and of North-East Burma.

Many hundreds of specimens having been examined for the purposes of this revision, it is impracticable, for considerations of space, to record all the collectors' data individually. Hence these have been summarized in the following form under each species:— (1) general distribution in China ; (2) locality, habitat and altitude ; (3) collectors and their numbers, in alphabetical and numerical sequence respectively.

Through the kindness of Professor Sir W. Wright Smith, the author has been able to examine the whole of the exceptionally rich Chinese material of *Gentiana* preserved at the Royal Botanic Garden, Edinburgh, including all the specimens in the Lévillé herbarium. Dr. E. D. Merrill had kindly sent on loan a very large number of specimens from the Herbarium of the University of California, and from the New York Botanical Garden. At Dr. Maxon's request, Dr. Killip has been good enough to send on loan all the Chinese specimens of *Gentiana* and *Crawfordia* in the United States National Herbarium, Washington. Dr. Harry Smith of Uppsala

has very kindly lent type specimens of all his new species, including a number of new ones for publication in the Kew Bulletin (*vide* p. 125). In order to complete the revision, type material has also been obtained on loan from the following Institutions: Muséum d'Histoire Naturelle, Paris; Botanischer Garten, Berlin; Principal Botanic Garden, Leningrad; Naturhistorisches Museum, Wien, and Botanisches Institut der Universität, Wien (by the courtesy of Dr. H. Handel-Mazzetti).

The author desires to record his best thanks to all the above-mentioned persons and to the Directors of the Institutions concerned for affording these facilities. Mr. I. H. Burkill very kindly placed at the author's disposal a large number of notes he had made on Asiatic species of the genus. Finally the author wishes to express his gratitude to Dr. T. A. Sprague and to Mr. H. K. Airy-Shaw for their friendly co-operation in the completion of the work.

KEY TO THE CHINESE SECTIONS OF GENTIANA

Plants of climbing habit, with distinctly twisted stems :

Seed winged (either surrounded by a discoid wing, or triquetrous, with one side shorter than the other two and all three edges winged) ; fruit capsular.....III. *Dipterospermum* (p. 139)

Seed not winged (triquetrous, with the three sides equal) ; fruit fleshyIV. *Tripterospermum* (p. 141).

Plants not climbing, stems not or scarcely twisted :

Corolla deeply lobed, with very short tube and small auriculate plicaeI. *Otophora* (p. 138)

Corolla funnel-shaped, campanulate or tubular-clavate, with a longer tube, 2-4 times as long as the lobes, seldom the same length; plicae always conspicuously developed, though sometimes short :

Stigma expanded, its lobes connate more or less in the form of a small plate or funnel.....

V. *Frigida* Ser. *Uniflorae* (*G. phyllocalyx*) (p. 143)

Stigma-lobes not expanded, linear, free, revolute, or sometimes short and a little expanded, but never connate in the form of a plate or funnel :

Style very long, equalling the elongated ovary or somewhat shorter; ovary many times longer than broad; capsule not rounded at the apex, and without wing-like appendages :

Plicae asymmetrical, deeply cut off from the corolla-lobe on the right as seen from within, fused with the corolla-lobe on the left; stem tetragonous; seeds winged

II. *Stenogyne* (p. 139)

Plicae symmetrical, corolla-lobes gradually attenuated into the tube; stem subterete; seeds not winged

VIII. *Isomeria* (p. 146)

Style short, sometimes absent, either conspicuously shorter than the ovary or, if equalling it (Sect. *Chondrophylla*), then the ovary is ellipsoid, and the capsule rounded at the apex with narrow wing-like antero-posterior appendages which are attenuate into the base :

Seeds covered with membranous scales, which form hexagonal honeycomb-like pits, or not scaly but covered with hexagonal pits.....V. *Frigida* (p. 141)

Seeds not covered with membranous scales or hexagonal pits :

Seeds smooth or minutely rugulose, not winged :

Perennial :

Plants large, usually tall with erect or ascending stems, mostly with a terminal inflorescence; leaves large, usually linear-lanceolate or oblong-ovate; rhizome covered with a fibrous investment.....VI. *Aptera* (p. 145)

Plants small, usually forming mats; leaves small; rhizome not covered with a fibrous investment.....IX. *Chondrophylla* (p. 146)

Annual.....IX. *Chondrophylla* (p. 146)

Seeds with 1-3 wings.....VII. *Pneumonanthe* (p. 146)

Sect. I. OTOPHORA.

Plant densely caespitose with numerous cauline leaves.....

Ser. i. *Otophorae*

Plant not caespitose; cauline leaves few.....Ser. ii. *Decoratae*

Ser. i. OTOPHORAE.

Flowers several or numerous in a densely fasciculate terminal inflorescence.....1. *otophora*

Flowers solitary, terminal :

Corolla scarcely divided to the middle.....2. *otophoroides*

Corolla divided to near the base :

Cauline leaves linear-lanceolate, 3 mm. wide; stems densely caespitose, spreading from a small caudex.....

3. *damyonensis*

Cauline leaves obovate, 6-7 mm. wide; stems few, arising from a rather stout non-fibrous caudex.....4. *sichitoënsis*

Ser. ii. DECORATAE.

Leaves and calyx-lobes aristate.....5. *caryophyllea*

Leaves and calyx-lobes not aristate :

Apex of leaves and calyx-lobes obtuse.....6. *tsarongensis*

Apex of leaves and calyx-lobes acute.....7. *decorata*

Sect. II. STENOGYNE.

Plicae of the corolla fimbriate :

Calyx-tube with broad wings.....**8. Kusnezowii**

Calyx-tube not winged.....**9. rhodantha**

Plicae of the corolla erose :

Corolla-lobes caudate.....**10. striata**

Corolla-lobes ecaudate :

Perennial, stem somewhat twining, leaves shortly but distinctly petioled, flowers solitary, terminal, pink.....

11. filicaulis

Annual, stem not twining, leaves sessile, flowers numerous on the branches :

Corolla-tube pubescent on the exterior of the veins.....

12. Souliei

Corolla-tube glabrous on the exterior of the veins :

Calyx-lobes narrowed at the base, with a rounded sinus

13. eurycolpa

Calyx-lobes never narrowed at the base, with an acute or truncate sinus :

Corolla small (up to 1.5 cm.) broadly infundibular, narrowed below into a long narrow tube.....

14. primuliflora

Corolla larger (exceeding 2 cm.), campanulate :

Calyx-tube winged and fringed :

Cauline leaves obtuse.....**21. pterocalyx**

Cauline leaves acute :

Upper leaves scabro-ciliate above...**15. gentilis**

Upper leaves glabrous above.....**16. pulchra**

Calyx-tube not winged and fringed :

Calyx-lobes linear-lanceolate, mucronate ; corolla about 3 cm. long.....**17. serra**

Calyx-lobes linear ; corolla about 2 cm. long :

Stamens longer than the plicae :

Calyx-lobes linear, $\frac{1}{3}$ the length of the tube ; corolla-tube several times longer than lobes.....**18. leptoclada**

Calyx-lobes narrowly triangular, $\frac{1}{3}$ the length of the tube ; corolla-tube $1\frac{1}{2}$ times longer than lobes.....**20. expansa**

Stamens shorter than the plicae.....

19. hapalocaula

Sect. III. DIPTEROSPERMUM.

Corolla-lobes small, triangular, acute, only slightly longer than the plicae (limb of corolla subtruncate) :

Leaves petiolate (petiole 1 cm. long) ; ovary stipitate ; calyx-lobes large, spatulate, erect ; leaves membranous 5-nerved ; anthers 2.5 mm. long.....**22. bomareoides**

Leaves subsessile (petiole scarcely 2 mm. long) :

Leaves more or less coriaceous, lanceolate acuminate :

Flowers 4-5 cm. long ; ovary stipitate ; style very short
23. crawfurdioides

Flowers less than 3.5 cm. long ; calyx-tube entire with 5 lobes ; ovary stipitate.....**24. fratriss**

Leaves membranous, broadly ovate to suborbicular.....
25. iochroa

Corolla-lobes ovate-lanceolate or lanceolate much longer than the plicae :

Corolla-tube curved :

Calyx-tube entire :

Calyx-lobes triangular ; capsule elliptic.....**28. khamensis**

Calyx-lobes linear, minute ; capsule oblong.....**27. discoidea**

Calyx-tube dimidiate spathaceous :

Calyx-lobes recurved ; anthers 2-3 mm. long.....
28. khamensis

Calyx-lobes erect ; anthers sagittate, tailed.....
26. curviflora

Corolla-tube straight :

Stamens winged on one side only :

Anthers 6-7 mm. long ; calyx-lobes ovate spatulate.....
29. semialata

Anthers 3.5 mm. long ; calyx-lobes triangular.....
30. sessiliflora

Stamens winged on both sides :

Ovary scarcely stipitate, style very long :

Calyx-lobes broadly triangular, recurved, corolla lobes attenuate.....**31. Heleni**

Calyx-lobes long, filiform, erect :

Plicae short, rounded at the apex :

Leaves subcoriaceous, cordate-ovate.....**32. cordata**

Leaves membranaceous, lanceolate :

Style 1 cm. long ; anthers 1 mm. long
33. membranacea

Style 5-6 mm. long, anthers 2 mm. long.....
34. cyanea

Plicae triangular, acute.....**35. Nienkui**

Ovary on a long stipe ; style very long.....
37. fascicularis var. **biflora**

Ovary on a long stipe ; style rather short :

Calyx-tube entire :

Calyx-lobes linear :

Corolla-lobes caudate.....**36. caudata**

Corolla-lobes muticous ; calyx distinctly keeled ; corolla large, purple.....**37. fascicularis**

Calyx-lobes foliaceous ; leaves 5-7-nerved, petiole 2 cm. long :

- Calyx-lobes connate, erect.....38. **Bulleyana**
 Calyx-lobes free, deltoid, recurved, petiole 3-4 mm.
 long.....39. **Pricei**
 Calyx-tube dimidiate-spathaceous.....40. **dimidiata**

Sect. IV. **TRIPTEROSPERMUM.**

- Fruit very succulent, oblong-ellipsoid, 2-2½ times as long as broad
 41. **trinervis** var. **oblonga**
 Fruit less succulent, cylindrical, at least 4 times as long as broad
 42. **luteo-viridis**

Sect. V. **FRIGIDA.**

- Leaves in whorls of three or more.....Ser. i. *Verticillatae*
 Leaves in pairs :
 Plant annual.....Ser. viii. *Annuae*
 Plant perennial :
 Flowers typically solitary, terminal :
 Plant with a thick caudex ; leaves closely imbricated, with
 a cartilaginous margin.....Ser. iv. *Confertifoliae*
 Plant without a distinct caudex ; leaves less rigid, not closely
 imbricated, without a cartilaginous margin :
 Leaves obovate, attenuate at the base :
 Corolla-tube markedly contracted at the mouth ; calyx-
 lobes spathulate, much narrowed below.....
 Ser. iii. *Suborbisepalae*
 Corolla-tube not contracted, usually somewhat expanded
 at the mouth ; calyx-lobes not narrowed below.....
 Ser. v. *Uniflorae*
 Leaves narrow, usually linear, acute, never obovate ;
 calyx-lobes linear, not narrowed below.....
 Ser. ii. *Ornatae*
 Flowers several together in the inflorescence :
 Radical leaves present, usually linear-lanceolate.....
 Ser. vii. *Multiflorae*
 Radical leaves absent.....Ser. vi. *Sikkimenses*

Ser. i. **VERTICILLATAE.**

- Leaves 3-5 in a whorl :
 Leaves 3 in a whorl.....43. **ternifolia**
 Leaves 4 in a whorl :
 Calyx 6-8-lobed :
 Cauline leaves obtuse, subapiculate, margins subglabrous ;
 style almost none.....44. **tetraphylla**
 Cauline leaves acuminate, acute, margins ciliate-scaberulous ;
 style 4-6 mm. long.....45. **quaterna**
 Calyx 5-lobed ; leaves obtuse, mucronate.....46. **ecaudata**
 Leaves 5 in a whorl :

- Central bud not prolonged as a stolon.....
50. hexaphylla var. **pentaphylla**
 Central bud prolonged as a stolon, 2-4 cm. long, rooting.....
47. viatrix
- Leaves 6-7 in a whorl :
 Corolla 1.7-2.2 cm. wide at the mouth :
 Stem erect or ascending, leaves not crowded, 2 mm. in width
48. subocculta
 Stem decumbent, leaves crowded on the stems, 1 mm. in width
49. heptaphylla
- Corolla up to 1.7 cm. wide :
 Leaves subobtusate to subacute ; corolla-lobes about 1 mm.
 long, caudate ; style none.....**50. hexaphylla**
 Leaves acuminate ; corolla-lobes about 2 mm. long, caudate ;
 style 3-5 mm. long.....**51. Arethusae**

Ser. ii. ORNATAE.

- Rosette leaves linear-lanceolate; flowers very deep blue ; anthocyanin
 pigment present in the calyx and stems ; lower leaves elliptic
 or obovate.....**52. Veitchiorum**
- Rosette leaves absent or inconspicuous; flowers pale blue ; anthocy-
 anin pigment not present in the calyx or stems ; lower leaves
 linear :
 Plant very small, leaves up to 8 mm. long ; corolla obconic, not
 exceeding 3.8 cm. long.....**53. oreodoxa**
 Plant larger, leaves usually longer ; corolla infundibular :
 Leaves linear; flowers usually pedicellate ; throat of the corolla
 white :
 Leaves and calyx-lobes subobtusate, rather short.....
54. Futtereri
 Leaves and calyx-lobes acute, usually very long.....
55. Farreri
 Leaves linear-lanceolate ; flowers sessile ; throat of the corolla
 blue :
 Calyx-lobes not exceeding 2 cm. long ; corolla deep blue ;
 leaves 1.5-2 mm. wide.....**56. sino-ornata**
 Calyx-lobes 3-4 cm. long ; corolla pale purple ; leaves up to
 3 mm. wide.....**57. helophila**

Ser. iii. SUBORBISEPALAE.

- Stamens equal :
 Corolla-tube 3-4 cm. long ; flowers purple or deep blue.....
58. stragulata
 Corolla-tube 2 cm. long ; flowers yellowish, spotted blue.....
59. tongolensis
 Stamens 3 long, 2 short.....**60. suborbisepala**

Ser. iv. CONFERTIFOLIAE.

Calyx-lobes not attenuate at the base :

Stamens as long as the corolla-tube ; flowers 3.5-4 cm. long ;
plicae obtuse, wider than the lobes ; stem very short with very
densely imbricate leaves.....**61. confertifolia**

Stamens much shorter than the corolla-tube ; flowers 6-7 cm.
long ; plicae subacute, much narrower than the lobes :

Calyx-lobes broad ; corolla deep ruddy purple, paler below
62. Georgei

Calyx-lobes narrow ; corolla blue with greenish white spots
on the veins.....**63. Szechenyii**

Calyx-lobes broadly obovate, acuminate, attenuate at the base.....
64. tizuensis

Ser. v. UNIFLORAE.

Calyx very small, completely enveloped by the uppermost pair of
broad, obtuse, obovate leaves.....**65. phyllocalyx**

Calyx not enveloped by the uppermost pair of leaves :

Style elongate ; length of the corolla about five times its diameter
66. filistyla

Style very short ; length of the corolla about 2-2½ times its
diameter :

Stems very short, scarcely 3 cm. high ; corolla-tube 8-10 mm.
in diameter, expanded in the middle ; cauline leaves
obovate :

Leaves 4 mm. wide ; corolla 2-2.5 cm. long, with short
truncate plicae.....**67. Wardii**

Leaves 6-7 mm. wide ; corolla 3 cm. long, with triangular
plicae.....**68. emergens**

Stems ascending, 4-8 cm. long ; corolla subcylindrical, 1.5 cm.
long, tube about 5-6 mm. in diameter ; cauline leaves
ovate.....**69. altigena**

Ser. vi. SIKKIMENSES.

Stamens equalling the corolla-tube in length, filaments very slender
70. chinensis

Stamens much shorter than the corolla-tube :

Filaments winged.....**71. Harrowiana**

Filaments not winged :

Leaves broadly petiolate ; corolla-lobes obtuse, about 3 mm.
long**72. sikkimensis**

Leaves sessile ; corolla-lobes triangular, acute, about 5 mm.
long.....**73. streptopoda**

Ser. vii. MULTIFLORAE.

Calyx-tube dimidiate-spathaceous ; lobes not reflexed.....
74. microdonta

Calyx-tube entire ; lobes erect, patent or reflexed :

Leaves ovate, abruptly attenuate at the base into a long petiole

75. melandriifolia

Leaves not abruptly attenuate at the base into a long petiole :

Calyx-lobes erect :

Flowers 1-3 together on very short stems ; plicae triangular

76. Duclouxii

Flowers numerous ; stems taller ; corolla more or less cylindrical ; plicae much shorter than the lobes :

Leaves all ovate-oblong, obtuse.....**77. rigescens**

Leaves on the stems lanceolate, acute or subacute :

Uppermost leaves surrounding the flowers large, oblanceolate, much exceeding the flowers.....

78. cephalantha

Uppermost leaves linear or linear-lanceolate, shorter :

Corolla-lobes shortly caudate ; plicae small, triangular, acute :

Stem scabrid, cauline leaves elliptic-lanceolate, apex acute.....**79. Davidi**

Stem glabrous ; leaves all linear-lanceolate, apex subobtuse.....**80. Atkinsonii**

Corolla-lobes ecaudate ; plicae truncate :

Calyx-lobes minute, subulate ; flowers sessile.....

81. wasenensis

Calyx-lobes linear to linear-lanceolate ; flowers pedicellate :

Anthers scarcely 2.5 mm. long ; style 3 mm. long :

Flowers 6-8 together in a terminal inflorescence ; leaves 5-8 mm. wide.....

82. Purdomi

Flowers 3 together, terminal ; leaves not exceeding 2.5 mm. wide.....

83. Chingii

Anthers about 3 mm. long ; style short :

Inflorescence trichotomous ; flowers axillary, the lower pedicels frequently very long ; corolla blue.....**84. trichotoma**

Inflorescence capitate ; flowers terminal ; corolla white.....**85. Przewalskii**

Calyx-lobes reflexed :

Basal leaves of the barren stems linear-lanceolate ; stems glabrous :

Corolla greenish-white with dark green spots and striae ; stamens much shorter than the corolla-tube.....

86. apiata

Corolla blue ; stamens slightly shorter than the corolla-tube.....**87. Wilsoni**

Basal leaves of the barren stems lanceolate ; stems more or less scaberulous :

Stamens nearly as long as the corolla-tube ; corolla unspotted, deep blue.....**88. atuntsiensis**

Stamens $2/3$ the length of the corolla-tube ; corolla spotted, yellow :

Corolla-lobes broadly triangular-ovate, obtuse.....

89. Handेलiana

Corolla-lobes ovate, acuminate.....**90. stictantha**

Ser. viii. ANNUAE.

Calyx 4-partite, strongly keeled.....(Subser. *Tetramerae*)

Corolla-tube 6-7 mm. wide ; lobes slightly exceeding the plicae ; calyx scarcely exceeding half the length of the corolla-tube

91. lineolata

Corolla-tube 12-14 mm. wide ; lobes 4 times as long as the plicae ;

calyx $2/3$ - $3/4$ the length of the corolla-tube.....**92. praeclara**

Calyx 5-partite, not keeled.....(Subser. *Pentamerae*)

Leaves linear.....**93. picta**

Leaves spatulate :

Flowers 1.5 cm. long ; corolla unspotted ; calyx-lobes large, spatulate.....**94. Blinii**

Flowers 2-3 cm. long ; corolla spotted on the exterior in the dried specimens ; calyx-lobes dimorphous, two of them linear-lanceolate, three larger, spatulate.....

95. yunnanensis

Sect. VI. APTERA.

Basal leaves linear-lanceolate (not exceeding 4 cm. wide) ; cauline leaves narrow, lanceolate, not forming an involucre around the flowers ; upper cauline leaves up to 7 cm. wide ; stem not very stout :

Ovary sessile :

Flowers pedicellate :

Calyx unilaterally divided, spathaceous ; pedicels very long
96. gracilipes

Calyx usually entire, lobes filiform ; pedicels short.....

97. dahurica

Flowers densely aggregated in a capitulum or in densely aggregated whorls :

Corolla-lobes slightly longer than the plicae ; leaves linear ; stem slender.....**98. siphonantha**

Corolla-lobes 2-3 times as long as the plicae ; cauline leaves large, broadly lanceolate ; stem very stout :

Flowers about 2 cm. long :

Calyx-lobes 4-5.....**99. macrophylla**

Calyx-lobes 3.....**100. Fettisowi**

Flowers 3.5-5 cm. long.....**101. pseudodecumbens**

Ovary stipitate :

Plant stemless or with an extremely short stem ; flowers in pairs.....**102. biflora**

Plant caulescent, bearing numerous flowers :

Flowers on distinct pedicels, not clustered in whorls.....**103. straminea**

Flowers sessile, clustered in whorls :

Corolla scarcely exceeding 2 cm. long :

Corolla blue ; lobes rounded at the apex, less than 2 mm. wide.....**104. wutaiensis**

Corolla yellowish ; lobes acute, acuminate, 3.5 mm. wide.....**105. officinalis**

Corolla about 3 cm. long, white ; lobes ovate, acute, 5 mm. wide.....**106. dendrologi**

Basal leaves broad, ovate-lanceolate, 5 cm. or more wide ; upper cauline leaves ovate, up to 7 cm. wide, forming an involucre around the congested flowers ; stem very stout.....**107. crassicaulis**

Sect. VII. PNEUMONANTHE.

Sole Chinese* species.....**108. scabra**

Sect. VIII. ISOMERIA.

Sole Chinese species.....**109. Delavayi**

Sect. IX. CHONDROPHYLLA.*

Plicae fimbriate.....Ser. ii. *Fimbriatae*

Plicae not fimbriate :

Calyx-lobes ovate-lanceolate, recurved.....Ser. iii. *Orbiculatae*

Calyx-lobes linear or narrow-triangular, acute :

Stem-leaves linear or subulate, long and very narrow.....Ser. iv. *Linearifoliae*

Stem-leaves not linear or subulate, shorter :

Lamina as well as other parts of the plant pubescent.....Ser. i. *Pubigeræ*

Lamina glabrous :

Flowers large, carmine-red (up to 5 cm. long).....Ser. v. *Rubicundæ*

Flowers small, blue or white.....Ser. vi. *Humiles*

Ser. i. PUBIGERÆ

Sole Chinese species.....**110. pubigera**

* The description of no. 184 *G. suchuenensis* Franch. is too imperfect to permit of its being inserted in the key.

Ser. ii. FIMBRIATAE.

- Rosette leaves linear-lanceolate, up to 3.5 cm. long, 1 cm. wide ;
stems much branched.....**111. Reynieri**
- Rosette leaves absent or ovate or ovate-lanceolate, up to 2 cm. long ;
Corolla-tube more than 3 times as long as the calyx-tube :
Stems unbranched ; plant very small, densely caespitose ;
anthers oblong, 1.2 mm. long.....**114. formosa**
- Stems branched ; plant larger, not caespitose :
Corolla-lobes rounded, erose ; flowers blue ; calyx-lobes
subulate ; anthers 1 mm. long.....**112. grata**
- Corolla-lobes entire, subapiculate ; flower large, pink ; calyx-
lobes narrow triangular, acute ; anthers 0.7 mm. long
113. burmensis
- Corolla-tube scarcely twice as long as the calyx-tube ; anthers
elongate, 1 mm. long :
Calyx-lobes 1.5 mm. long ; corolla-lobes rounded at the apex :
Corolla up to 1.5 cm. long ; cauline leaves obtuse.....
115. saltuum
- Corolla up to 1 cm. long ; cauline leaves acute.....
116. oligophylla
- Calyx-lobes 3-4 mm. long ; leaves lanceolate or ovate, acute :
Cauline leaves deltoid-ovate, acute or acuminate ; corolla-
lobes subobtuse.....**117. panthaica**
- Cauline leaves elliptic-ovate ; corolla-lobes acuminate.....
118. epichysantha

Ser. iii. ORBICULATAE.

- Flowers fasciculate.....**119. intricata**
- Flowers solitary, terminal, or stems branched below :
Plicae laciniate.....**120. Jamesii**
- Plicae not laciniate :
Upper cauline leaves reniform ; corolla-tube about twice the
length of the calyx-tube.....**121. crassuloides**
- Upper (and lower) cauline leaves elliptic-ovate narrower than
broad ; corolla-tube scarcely exceeding the calyx-tube :
Style distinct ; plicae bifid.....**122. pseudosquarrosa**
- Style absent :
Radical leaves few ; plicae obtuse.....**123. Crassula**
- Radical leaves numerous ; plicae acute.....**124. squarrosa**

Ser. iv. LINEARIFOLIAE.

- Interior of the upper part of the corolla-tube pubescent :
Hairs in the throat of the corolla short ; lobes twice as long as
the plicae.....**125. faucipilosa**
- Hairs in the throat of the corolla long, pilose ; lobes slightly
exceeding the plicae.....**126. cuneibarba**

Interior of the upper part of the corolla-tube glabrous :

Calyx-lobes patent.....**127. asterocalyx**

Calyx-lobes erect :

Flowers 2.5-3 cm. long ; cauline leaves erect...**128. scariosa**

Flowers 1-1.5 cm. long ; cauline leaves more or less incurved :

Corolla-lobes obtuse : plicae laciniate, obtuse, half the length
of the lobes.....**129. aristata**

Corolla-lobes acute, more or less cuspidate ; plicae almost as
long as the lobes :

Plant unbranched, with a single stem, without distinct
basal leaves.....**130. linoides**

Plant with numerous stems arising from a basal rosette of
broad, ovate leaves with a distinct hyaline margin.....

131. choanantha

Ser. v. RUBICUNDAE.

Corolla 5-6 cm. long ; rosette leaves smaller than the cauline leaves ;
calyx-lobes 6-9 mm. long.....**132. purpurata**

Corolla 2-3 cm. long ; calyx-lobes 2-3 mm. long :

Cauline leaves ovate, scarcely 1 cm. long ; rosette leaves larger
than the cauline leaves.....**133. rubicunda**

Cauline leaves lanceolate, about 2 cm. long ; rosette leaves smaller
than the cauline leaves.....**134. Bodinieri**

Ser. vi. HUMILES.

Calyx-lobes normally distinctly recurved :

Plant minute ; flowers about 4 mm. long ; leaves without a distinct
cartilaginous margin.....**135. subtilis**

Plant larger ; flowers usually exceeding 5 mm. (frequently 10-12
mm.) long :

Leaves with a very distinct cartilaginous margin ; stems single,
more or less branched, with numerous flowers.....

136. Yokusai

Leaves without a thickened cartilaginous margin ; stems
several from the root, unbranched, with a single terminal
flower.....

137. pallescens

Calyx-lobes always erect, ascending, or spreading :

Flowers minute, 3 mm. long, terminal on very small stems.....

138. microphyta

Flowers larger, on a much larger plant :

Perennial with a small caudex bearing the bases of the old
leaves and large fleshy roots.....**139. napulifera**

Annual without large fleshy roots or caudex :

A. Stems numerous from the root, unbranched, with a single ter-
minal flower ; cauline leaves acute or obtuse at the apex, but
never rounded :

Leaves and calyx-lobes mucronate ; corolla usually closed, rarely
almost open :

- Flowers with elongate pedicels; calyx not enclosed by the uppermost leaves; ripe capsule enclosed in the corolla: Corolla-lobes deltoid, acute.....**140. aperta**
 Corolla-lobes broad, obtuse.....**141. Ivanoviczii**
- Flowers with short pedicels; calyx partly enclosed by the uppermost leaves; ripe capsule more or less exerted from the corolla.....**143. leucomelaena**
- Leaves and calyx-lobes mucronate; corolla usually open:
 Cauline leaves spatulate with recurved acuminate apex:
 Corolla opening widely, lobes obtuse; plicae triangular, entire or shortly bidentate at the apex.....
144. spathulifolia
 Corolla closed; lobes acute; plicae ovate, obtuse, mucronate
145. pseudoaquatica
- Cauline leaves narrow-linear or narrow-lanceolate with a long point, or oval-ovate with a short point:
 Cauline leaves lanceolate or linear-lanceolate; calyx-lobes not keeled:
 Plant dwarf, up to 2.5 cm.; flowers sessile.....**146. Grumii**
 Plant up to 17 cm.; flowers long-pedicellate.....
147. heleonastes
- Cauline leaves oval or ovate:
 Calyx-lobes not keeled.....**148. deltoidea**
 Calyx-lobes keeled:
 Basal leaves oblong-lanceolate, up to about 6 mm. wide (rarely more); flowering stems very numerous; corolla 1-1.5 cm. long.....**149. Prattii**
 Basal leaves broadly ovate, 8-15 mm. wide; flowering stems fewer or very few:
 Fruit extruded from the corolla; corolla up to 1.2 cm. long; cauline leaves numerous, densely imbricated
150. incompta
 Fruit included in the corolla; corolla 1.5-2 cm. long; cauline leaves few, distant.....**151. Licentii**
- B. Stem single, bearing one or more flowers, or branched from the base:**
 Flowers sessile:
 Flowers congested at the apex of the stem; stems dark brown, densely scaberulous.....**152. praticola**
 Flowers not congested at the apex of the stems; stems not densely scaberulous:
 Corolla 2-2.5 cm. long; cauline leaves spatulate.....
153. aphrosperma
 Corolla up to 1.4 cm. long; cauline leaves ovate.....
142. parvula
- Flowers pedicellate, solitary; stem not densely scaberulous:
 Calyx-tube with distinct transparent ribs alternating with the vascular bundles below the lobes:

Plicae nearly as long as the corolla-lobes :

Stem glabrous :

Rosette leaves ovate, 6-8 mm. long ; flowers 2-2.5 cm. long, corolla-lobes mucronate.....**154. radiata**

Rosette leaves ovate to ovate-orbicular, 12-29 mm. long ; corolla-lobes scarcely mucronate.....**155. bella**

Stem puberulous.....**156. pubicaulis**

Plicae about half as long as the corolla-lobes :

Rosette leaves lanceolate.....**157. Piasezkii**

Rosette leaves elliptic-ovate :

Corolla 1 cm. long, 2 mm. wide ; leaves ciliate.....

158. inconspicua

Corolla 1.5 cm. long, 0.5 mm. wide ; leaves not or scarcely ciliate.....**159. flexicaulis**

Calyx-tube without distinct transparent ribs alternating with the vascular bundles below the lobes :

Leaves with a very wide scarious margin ; flowers densely aggregated.....**160. albo-marginata**

Leaves without a wide scarious margin ; flowers not densely aggregated :

Stems weak, ascending :

Calyx-lobes spreading ; corolla only slightly longer than calyx.....**174. moniliformis**

Calyx-lobes erect ; corolla about twice as long as the calyx :

Pedicels up to 1 cm. long :

Cauline leaves orbicular.....**158. inconspicua**

Cauline leaves ovate.....**161. stellulata**

Pedicels over 1 cm. long :

Cauline leaves ovate or lanceolate, acute, scarcely 4 mm. in length :

Calyx-lobes less than half the length of the tube ; cauline leaves more or less adpressed to the stem.....**162 Forrestii**

Calyx-lobes equalling the tube ; cauline leaves recurved.....**163. myrioclada**

Cauline leaves obtuse or subobtuse, larger :

Plicae truncate ; leaves sessile.....**164. Mairei**

Plicae acute ; leaves shortly petiolate.....

165. vandellioides

Stems more or less rigid ; pedicels short or flowers sessile :

I. Cauline leaves obovate-spathulate or suborbicular, rounded and sometimes mucronate at the apex :

Corolla less than 1 cm. long.....**166. riparia**

Corolla exceeding 2 cm. long :

Flowers sessile ; cauline leaves decreasing in size towards the base of the stem, suborbicular, the upper ones 6 mm. wide, the lower ones very small.....**167. nanobella**

Flowers pedicellate; cauline leaves not markedly decreasing in size towards the base of the stem, spatulate, rarely exceeding 3 mm. in width.....**168. pudica**

II. Cauline leaves lanceolate or ovate, attenuate at the apex:

Leaves without a cartilaginous border.....**169. Loureirii**

Leaves with a cartilaginous border:

Plant densely clothed with papillae, which are very conspicuous on the under-side of the midrib and margins of the leaves
170. papillosa

Plant not clothed with papillae, or papillae present on the stem only; leaves glabrous:

Calyx-lobes subpatent, rosette leaves usually none.....
171. alsinoides

Calyx-lobes erect, rosette leaves usually present:

Stem simple; leaves small, distant, mucronate, recurved
172. maeulchanensis

Stem branched; leaves not recurved:

Rosette leaves narrow, lanceolate, attenuate, 3-5 cm. long.....**173. heterostemon**

Rosette leaves ovate, rarely exceeding 1.5 cm. in length:

Corolla-lobes caudate.....**175. chungtienensis**

Corolla-lobes not caudate:

Plicae triangular, acute:

Fruit not exserted on a long stipe.....**176. pedata**

Fruit exserted on a long stipe:

Style absent or nearly so; uppermost 3 mm. of filaments free; leaves lanceolate.....

177. macrauchena

Style about 2 mm. long; uppermost 6-7 mm. of filaments free; leaves ovate.....

178. subuniflora

Plicae more or less truncate or obtuse; fruit not or scarcely exserted:

Flowers 4-9 mm. long, plant minute with very closely imbricate leaves:

Stamens equal in length.....

179. Franchetiana

Stamens unequal in length.....**180. exigua**

Flowers 10-15 mm. long; plant larger;

Leaves not imbricate; stamens unequal in length.....**181. anisostemon**

Leaves closely imbricate; stamens equal in length:

Stem glabrous.....**182. tatsienensis**

Stem minutely scabrid, reddish brown.....

183. taliensis

IMPERFECTLY KNOWN SPECIES.

184. G. sutchuenensis.

ENUMERATION OF SPECIES AND VARIETIES.

Sect. I. **OTOPHORA** *Kusnez.* in Act. Hort. Petrop. **15**, 246 (1898); Marquand in Journ. Roy. Hort. Soc. **57**, 190 (1932).

Ser. i. **OTOPHORAE** *Marquand*, series nova.

Plantae dense caespitosae; folia caulina numerosa.

1. **G. otophora** *Franch. apud Hemsl.* in Journ. Linn. Soc., Bot. **26**, 130 (1890); *Kusnez. Monogr.* 247.

N.W. Yunnan and the adjoining parts of S.E. Tibet and N.E. Upper Burma.—In rocky alpine meadows and marshes, 3200–4200 m.—*Delavay* 1236; *Forrest* 3824, 6825, 11530, 14687, 19062, 24944, 27222; *Handel-Mazzetti* 8420, 9914; *Rock* 6356; *Schneider* 3050.

2. **G. otophoroides** *H. Sm.* in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, **63**, 101 (*Hand.-Mazz. Pl. Nov. Sin., Fortsetz.* **40**, 7); et in *Hand.-Mazz. Symb. Sin.* **7**, 971 (1936).

N.W. Yunnan and the borders of Tsarong in S.E. Tibet and Upper Burma.—In open moist alpine meadows on mica-schist soil, 4000–4500 m.—*Farrer* 1883; *Forrest* 20229, 22930; *Handel-Mazzetti* 9894.

3. **G. damyonensis** *Marquand* in Kew Bull. 1928, 51; et in Journ. Roy. Hort. Soc. **57**, 190 (1932).

S.W. Szechwan.—Alpine pastures at Damyon, 4800–5200 m.—*Kingdon Ward* 5377.

This species has also been found outside the area covered by this paper, on the Tibet-Burma frontier, on rocky turf slopes which are more or less covered with dwarf *Rhododendron* in the valley of the Seinghku (82° 10' N., 97° 20' E.), *Kingdon Ward* 7591; and in Tibet, *Kingdon Ward* 10099.

4. **G. sichitoënsis** *Marquand* in Kew Bull. 1928, 56.

S.E. Tibet.—On open alpine meadows on the Salwin-Kiu-chiang divide north-west of Si-chi-to in Tsarong, 4200 m.—*Forrest* 22794.

Also found on the Tibet-Burma frontier in the Valley of the Seinghku, on steep alpine turf slopes, 3400–3600 m.—*Kingdon Ward* 7591.

Ser. ii. **DECORATAE** *Marquand*, series nova.

Plantae haud caespitosae; folia caulina pauca.

5. **G. caryophyllea** *H. Sm.* in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, **63**, 101 (*Hand.-Mazz. Pl. Nov. Sin., Fortsetz.* **40**, 7); et in *Hand.-Mazz. Symb. Sin.* **7**, 970 (1936).

N.E. Upper Burma or Yunnan.—In the neighbourhood of the Gomba-La and on the N'Maikha-Salwin divide, on open stony alpine meadows and grassy slopes and schistose soil, 3400–4200 m.—*Farrer* 1185, 1890; *Forrest* 24946; *Handel-Mazzetti* 9876.

6. *G. tsarongensis* Balf. f. et Forrest ex Marquand in Kew Bull. 1928, 62.

S.E. Tibet.—Tsarong, on the Doker La and the Salwin-Kiu-chiang divide, on damp stony pastures, 3900 m.—Forrest 14567, 18997, 19053, 22790.

7. *G. decorata* Diels in Notes Roy. Bot. Gard. Edinb. 5, 220 (1912).

Yunnan.—Mekong-Salwin divide, on open stony pasture, 3900 m.—Forrest 3021, 3827, 6940, 20719; Rock 6276, 6345; Kingdon Ward 107.

Sect. II. *STENOGYNE* Franch. ex Kusnez. in Act. Hort. Petrop. 15, 248 (1898); Marquand in Journ. Roy. Hort. Soc. 57, 191 (1932).

8. *G. Kusnezowii* Franch. in Bull. Soc. Bot. France, 43, 492 (1896).

Yunnan.—Near Mengtze, in upland grassy downs at 2000 m.—Hancock 43; Henry 10023.

9. *G. rhodantha* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. 26, 133 (1890); Kusnez. Monogr. 251.—*G. Jankae* Kanitz, Plant. Exped. Széchenyi a de Lóczy in As. Centr. Coll. 41 (1891).

Yunnan and Hupeh, Western Szechwan and Kweichow.—Calcareous meadows and clefts of rocks, on the edges of dry pine woods and similar situations, 400–3500 m.—Cavalerie 561, 631; Ducloux 518; Delavay 1869; Esquirol 229, 285; Hancock 10781; Henry 508, 964, 2990, 4606, 9832, 9836, 12767, 12767a; Kingdon Ward 4978, 4998; Maire 904, 1513; Rock 11581.

10. *G. striata* Maxim. in Bull. Acad. Sc. Pétersb. 27, 501 (1881); Mém. Biol. 11, 265; Kusnez. Monogr. 250.—*G. tricholoba* Franch. in Bull. Soc. Bot. France 43, 490 (1896). *G. Schlechteriana* Limpr. f. in Fedde Repert. Beih. 12, 467 (1922).

Kansu and N.E. Tibet.—On open ground and grassy slopes.—Ching 815; Cunningham 354; Fang 4335; Farrer 724; Licent 4772; Rock 14863; Wilson (Veitch Exped.) 4144, 4144a.

11. *G. filicaulis* Hemsl. in Journ. Linn. Soc., Bot. 26, 127 (1890); Kusnez. Monogr. 253.

Hupeh.—In the neighbourhood of Fang, not seen from elsewhere and habitat not stated by original collector.—Henry 6842.

Note. This species shows some transition to Section *Dipterospermum* in the twisting of the stem.

12. *G. Souliei* Franch. in Bull. Soc. Bot. France, 43, 491 (1896).

E. Szechuan.—In wet places around Tongolo and Dzeura.—Soulie 194.

var. *flavo-viridis* Marquand—*G. pterocalyx* var. *flavo-viridis* Marquand in Kew Bull. 1928, 54.

N.W. Yunnan.—Eastern flank of Lichiang Range, 27° 30' N., in open stony pastures, 3400 m.—*Forrest* 6531, 15116; *Schneider* 2340, 3002, 3135; *Rock* 11450.

13. *G. eurycolpa* Marquand in Kew Bull. 1931, 71.

Yunnan.—On grassy mountains, 2400–3000 m.—*Henry* 10023; *Maire in Herb. Bonati* 2910, 7404.

14. *G. primuliflora* Franch. in Bull. Soc. Bot. France, 31, 375 (1884); *Kusnez. Monogr.* 253.

Yunnan.—On open moist pasture on the Tali Range at 3900 m.—*Delavay* sine no.; *Ducloux* 570; *Forrest* 15526; *Maire* 1516; *Siméon Ten* 11.

15. *G. gentilis* Franch. in Bull. Soc. Bot. France, 43, 491 (1896).

Yunnan.—Mountain pastures, on open hillsides, 3000–4800 m.—*Delavay* sine no. anno 1883–85; *Ducloux* 800.

16. *G. pulchra* H. Sm. in Hand.-Mazz. Symb. Sin. 7, 951 (1936).

Yunnan.—Lichiang range, 2425–2500 m.—*Handel-Mazzetti* 3751; *Forrest* 2493; *McLaren* "N" 230; *Rock* 5032, 6174, 7788, 10715, 10748, 10839, 10878, 17253.

17. *G. serra* Franch. in Bull. Soc. Bot. France, 31, 376 (1884); *Kusnez. Monogr.* 252.

Yunnan.—In grassland on the mountains, 2500–3000 m.—*Delavay* 1238; *Forrest* 301, 3040; *Henry* 10023 in Herb. Kew., non in Herb. Edinb.; *Kingdon Ward* 5000; *Limpricht* 1138; *Schneider* 3707.

18. *G. leptoclada* Balf. f. et *Forrest* in Notes Roy. Bot. Gard. Edinb. 4, 71, t. 14 (1907).

Yunnan.—Valley of the Yangtze above Shiti Ko, 2100–2700 m.—*Forrest* 409.

19. *G. hapalocaula* Marquand in Kew Bull. 1928, 52.

N.W. Yunnan.—On the Tong shan in the Yangtze bend, 27° 20' N., 3000 m., Oct. 1913, amongst grass in open situations.—*Forrest* 11444.

20. *G. expansa* H. Sm. in Hand.-Mazz. Symb. Sin. 7, 951 (1936).

Yunnan.—In surroundings of the woods near Nigu near Tieso (alt. not stated).—*Ten* 282 (type in Herb. Berol.), 1393; *Ducloux* 4875.

21. *G. pterocalyx* Franch. in Journ. Linn. Soc., Bot. 26, 132 (1890); Kusnez. Monogr. 252; Marquand in Journ. Roy. Hort. Soc. 57, 191 (1932).

Yunnan.—*Delavay*, sine no. ; *Forrest* 15116.

Sect. III. **DIPTEROSPERMUM** (*C. B. Clarke*) *Marquand* in Kew Bull. 1931, 69; et in Journ. Roy. Hort. Soc. 57, 191 (1932).—*Crawfurdia*, subgenus *Dipterospermum* *C. B. Clarke* in Journ. Linn. Soc., Bot. 14, 442 (1875); et in Hook. f. Fl. Brit. Ind. 4, 106 (1883).

22. *G. bomareoides* *Marquand* in Kew Bull. 1931, 73.

N.E. Upper Burma*.—N'Maikha-Salwin Divide, 26° 45' N., 98° 48' E., on scrub and grassland, 2100-2400 m.—*Forrest* 27558.

23. *G. crawfurdioides* *Marquand* in Kew Bull. 1931, 72.

S.E. Tibet.—Tsarong, Mekong-Salwin divide and Shweli-Salwin divide, on scrub and grass in open dry situations, 2100-2400 m.—*Forrest* 14789, 16880.

var. *macrophylla* *Marquand* in Kew Bull. 1931, 73.

N.E. Upper Burma*.—N'Maikha-Salwin divide, 26° 45' N., 98° 48' E., 3400-3600 m.—*Forrest* 27442.

24. *G. fratris* *Marquand* in Kew Bull. 1931, 70.—*Crawfurdia Delavayi* Franch. in Bull. Soc. Bot. France, 46, 306 (1899).

Yunnan.—Tsang, Lichiang and Muli mountains, on grass and scrub, 3000-3600 m.—*Delavay*, sine no.

25. *G. iochroa* *Marquand* in Kew Bull. 1931, 74.

S.E. Tibet.—Tsarong, Salwin-Kiu-chiang divide, 28° 40' N., 98° 15' E., in open pastures on the margins of forests.—*Forrest* 18974.

26. *G. curviflora* *Marquand* in Kew Bull. 1931, 74.

S. Szechwan.—Muli, on shady limestone cliffs, 2700-3000 m.—*Kingdon Ward* 4880.

27. *G. discoidea* *Marquand* in Kew Bull. 1931, 72.

W. Hupeh.—Patung district, on the mountains near Ningpo and elsewhere, not precisely localized.—*Henry* 1038, 2848, 4877; *Wilson* (Veitch Exped.) 1742.

28. *G. khamensis* *Marquand* in Kew Bull. 1931, 70.—*Crawfurdia tibetica* Franch. in Bull. Soc. Bot. France, 46, 307 (1899); non *Gentiana tibetica* King ex Hook. f. (1883).

W. Szechwan.—Ta-t sien-lu.—*Soulié*; *Wilson* (Veitch Exped.) 2453.

* These are inserted as they occur near the Chinese frontier.

29. *G. semialata* Marquand in Kew Bull. 1931, 75.

W. Szechwan.—Litang-Yalung divide, on limestone cliffs, 3600 m.—*Kingdon Ward* 4984.

30. *G. sessiliflora* Marquand in Kew Bull. 1931, 76.

W. China.—Probably W. Szechwan, precise locality unknown.—*Wilson* (Veitch Exped.) 4150.

31. *G. Heleni* Marquand in Kew Bull. 1931, 69 ; et in Journ. Roy. Hort. Soc. 57, 192 (1932).—*Crawfurdia Trailliana* Forrest in Notes Roy. Bot. Gard. Edinb. 17, 76 (1907); non *Gentiana Trailliana* Forrest (1907).

N.W. Yunnan.—Salwin-Irrawadi divide, Shweli-Salwin divide and neighbourhood, in damp shady situations on tall grass and scrub, 1500–2100 m.—*Forrest* 963, 9422, 16169, 25997.

32. *G. cordata* Marquand in Kew Bull. 1931, 77.

Yunnan.—Yeng Chen Lin Mountain.—*Henry* 11186.

W. Szechwan.—Mount Omei and the neighbourhood of Ta-tsien-lu, 1500–2100 m.—*Faber* 171, 293 ; *Henry* 8881 ; *Pratt* 431 ; *Wilson* (Veitch Exped.) 4151, 5105, 5105A (type).

33. *G. membranacea* Marquand in Kew Bull. 1931, 75.

N.E. Upper Burma*.—26° 23' N., 98° 48' E., on scrub and cane brakes on the margins of thickets.—*Forrest* 25060.

34. *G. cyanea* Marquand, nom. nov.—*Crawfurdia coerulea* Hand.-Mazz. in Hand.-Mazz. Symb. Sin. 7, 950 (1936); non *Gentiana coerulea* Moc. et Sessé (1887–90).

Szechwan.—Between Yenyüen and Kwapi, climbing among bamboos, 3050 m.—*Handel-Mazzetti* 5556.

35. *G. Nienkui* Marquand in Kew Bull. 1931, 76.

Hongkong.—In a wood.—*N.K. Chun* 40111.

36. *G. caudata* Marquand in Kew Bull. 1931, 78.

Szechwan.—N. Wushan.—*Henry* 7091.

37. *G. fascicularis* Marquand in Kew Bull. 1931, 70.—*Crawfurdia fasciculata* Wall. Tent. Fl. Nep. 63, t. 47 (1826) ; non *Gentiana fasciculata* Hayata (1908).

Kiangsi.—Kuling Lu Shan.—*Steward* 2732.

Hupei.—Fang (habitat and altitude unknown).—*Henry* 6654A.

38. *G. Bulleyana* (Forrest) Marquand, comb. nov.—*Crawfurdia Bulleyana* Forrest in Notes Roy. Bot. Gard. Edinb. 4, 77 (1907).

Upper Burma.—Ming-kwong-Irrawaddi and Irrawaddi-Salwin divides, in bamboo brakes and on scrub, 2400–3400 m.—*Forrest* 839.

* This species is included as it occurs near the Chinese frontier.

39. *G. Pricei* Marquand in Kew Bull. 1931, 75.

Fukien, Kwangsi and Kwangtung.—Open mountainous country, 1000 m.—Price 1169 (type); Ko 53593, 53689 ; Kwangsi Museum (collector not noted) 255.

40. *G. dimidiata* Marquand in Kew Bull. 1931, 77.

Yunnan.—Shweli-Salwin divide, on cane brakes and scrub, 3400 m.—Forrest 25225.

Sect. IV. **TRIPTEROSPERMUM** (Bl.) Marquand in Kew Bull. 1931, 70 ; et in Journ. Roy. Hort. Soc. 57, 192 (1932).—*Tripterospermum* Blume, Bijdr. 849 (1825). *Crawfurdia*, subgenus *Tripterospermum* C. B. Clarke in Journ. Linn. Soc., Bot. 14, 442 (1875); et in Hook. f. Fl. Brit. Ind. 4, 107 (1883).

41. *G. trinervis* (Thunb.) Marquand, comb. nov.—*Convolvulus trinervis* Thunb. Fl. Jap. 85 (1784). *Crawfurdia japonica* Sieb. et Zucc. in Abh. Akad. Muench. 4, pt. 3, 160 (1846). *Golowninia japonica* (Sieb. et Zucc.) Maxim. in Bull. Acad. Pétersb. 4, 252 (1862) ; Mém. Biol. 4, 41. *Crawfurdia trinervis* (Thunb.) Mak. in Bot. Mag. Tokyo, 16, 171 (1902), non D. Dietr. *Gentiana Golowninia* Marquand in Kew Bull. 1931, 70 ; et in Journ. Roy. Hort. Soc. 57, 192 (1932).

var. *oblonga* Marquand, comb. nov.—*G. Golowninia* var. *oblonga* Marquand in Kew Bull. 1931, 79.

Kweichow and Hupeh.—On open hillsides, 450 m.—Henry 7416 ; Tsiang 4637, 7559 ; Wilson (Veitch Exped.) 1687.

42. *G. luteo-viridis* C. B. Clarke in Journ. Linn. Soc., Bot. 14, 443 (1875).—*Crawfurdia japonica* Sieb. et Zucc., var. *luteo-viridis* C. B. Clarke in Hook. f. Fl. Brit. Ind. 4, 108 (1883).

Yunnan, Kweichow, Hupeh.—Climbing trees in dry ravines, 400–500 m.—Cavalerie 414, 469 ; Henry 95, 2661, 9474 ; Silvestri 1827, 9474.

Sect. V. **FRIGIDA** Kusnez. in Act. Hort. Petrop. 13, 61 (1893) ; Marquand in Journ. Roy. Hort. Soc. 57, 193 (1932).

Ser. i. **VERTICILLATAE** Marquand in Journ. Roy. Hort. Soc. 57, 193 (1932), in clavi.

Perennes ; folia verticillata, 3–7-nata, angusta ; flores magni, terminales, solitarii.

43. *G. ternifolia* Franch. in Bull. Soc. Bot. France, 31, 377 (1884) ; Kusnez. Monogr. 269.

Yunnan and N.W. Szechwan.—On mountains, 3000–4100 m.—Delavay 1240 ; Fang 3551 ; H. Smith 4256, 4258, 4569.

44. *G. tetraphylla* *Kusnez. ex Maxim.* in Mél. Biol. 13, 338 (1892) et in Bull. Acad. Pétersb. 35, 350 (1894); *Kusnez. Monogr.* 270.
N.W. Szechwan and S.W. Kansu.—3600–4500 m.—*Potanin* sine no.; *Rock* 14638; *Wilson* (Veitch Exped.) 4143a.
45. *G. quaterna* *H. Sm.* in Kew Bull. 1937, 125.
N.W. Szechwan.—Alpine meadows, 3600–4100 m.—*H. Smith* 4210, 4249.
Dr. Harry Smith considers this to be of hybrid origin, and describes one variety and two subspecies under it.
46. *G. ecaudata* *Marquand* in Kew Bull. 1928, 51.
S.E. Tibet, Tsarong.—On open moist moorland on the Salween-Kiu-chiang divide, north-west of Si-chi-to, 38° 48' N., 98° 15' E., 4500 m.—*Forrest* 22797.
47. *G. viatrix* *H. Sm.* in Kew Bull. 1937, 127.
N.W. Szechwan.—Matang, on open alpine meadows, 4800 m.—*H. Smith* 4345.
48. *G. subocculta* *Marquand* in Kew Bull. 1931, 81.
N.W. Yunnan and S.E. Tibet.—In open moist stony meadows, 3600–4200 m.—*Forrest* 405, 19103, 20746, 25954; *Rock* 17266.
49. *G. heptaphylla* *Balf. f. et Forrest* in Notes Roy. Bot. Gard. Edinb. 4, 72, t. 13 (1907), emend. *Marquand* in Kew Bull. 1931, 81.
N.W. Yunnan and S.E. Tibet.—In bare dry grassland on mountain summits, 4500–4800 m.—*Forrest* 45, 14746.
50. *G. hexaphylla* *Maxim. ex Kusnez.* in Mél. Biol. 13, 337 (1892), et in Bull. Acad. Pétersb. 35, 349 (1894); *Kusnez. Monogr.* 270; *Marquand* in Journ. Roy. Hort. Soc. 57, 194 (1932); *Wilkie, Gentians*, 75, fig. 40 (1936).
W. Kansu and W. Szechwan.—On grassy slopes of the mountains, 3000–3600 m.—*Farrer* 217; *Potanin* sine no.; *Purdom* sine no.; *Kingdon Ward* 4638.
- var. *caudata* *Marquand* in Kew Bull. 1931, 81.
Kansu.—Upper Kar Ching K'ou, near Old Taochow, 3800–4300 m.—*Ching* 870; *Rock* 13736.
- var. *pentaphylla* *H. Sm.* in Hand.-Mazz. Symb. Sin. 7, 974 (1936).
Shensi.—Between Toumengung and Fangyangse.—*Licent* 2840.
51. *G. Arethusae* *Burkill* in Journ. Proc. As. Soc. Beng. n. s. 2, 309 (1906).
Shensi, W. Kansu and W. Szechuan.—On mountain summits, 3000 m.—*Giraldi* sine no.; *Farges* sine no.; *Licent* 2840, 2892; *Limpricht* 2341, 2358; *Purdom* 528; *Rock* 16853.

var. *delicatula* Marquand in Kew Bull. 1931, 81.

S.E. Tibet.—Tsarong, Doker-La, Mekong-Salwin divide, 28° 20' N., on moist stony pastures, 4200 m.—Forrest 14854.

var. *rotundato-lobata* Marquand in Kew Bull. 1931, 82.

N.W. Yunnan.—Mekong-Salwin divide, 27° 30' N., 98° 56' E., on open moorland, 4200 m.—Forrest 20766.

Ser. ii. ORNATAE Marquand in Journ. Roy. Hort. Soc. 57, 193 (1932), in clavi.

Perennes ; folia opposita, angusta ; flores magni, terminales, solitarii.

52. *G. Veitchiorum* Hemsl. in Gard. Chron. 46, 178 (1909) ; Marquand in Journ. Roy. Hort. Soc. 57, 195 (1932) ; Wilkie, Gentians, 138, fig. 81. (1936)—*G. ornata* Wall. var. *acutifolia* Franch. in Bull. Soc. Bot. France, 43, 494 (1896).

W. Szechwan and E. Tibet.—In alpine meadows and marshy moorland, 3000–5000 m.—Cunningham 303 ; Forrest 6707, 17015, 20875 ; Hosie sine numero ; Handel-Mazzetti 8752 ; Rock 11523, 18239 ; Soulié 67, 681 ; Wilson (Veitch Exped.) 4141, 4143, 4143b.

var. *caelestis* Marquand in Kew Bull. 1931, 84.—*G. caelestis* (Marquand) H. Sm. in Hand.-Mazz. Symb. Sin. 7, 972 (1936), as "*G. coelestis*."

N.W. Yunnan.—On the Lichiang Range and neighbouring mountains, in alpine meadows and among limestone rocks, 3000–4000 m.—Handel-Mazzetti 8752, Maire 2722 ; Rock 7785, 8752, 10763, 10858.

var. *altorum* (H. Sm.) Marquand comb. nov.—*G. altorum* H. Sm. in Kew Bull. 1937, 129.

W. Szechwan.—Sikang, Taofu district, in alpine meadows, 4200–5000 m.—H. Smith 11699, 12534, 12535, 12536, 13927, 13931, 13932.

53. *G. oreodoxa* H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, 63, 99 (Hand.-Mazz. Pl. Nov. Sin. Fortsetz. 40, 5) ; et in Hand.-Mazz. Symb. Sin. 7, 973 (1936).

Yunnan.—On the Mekong-Salwin divide, in open moist pastures, 4200–4400 m.—Forrest 14843 ; Handel-Mazzetti 8431.

54. *G. Futtereri* Diels et Gilg ex Diels in Futterer, Durch Asien, Bot., reimpr. 14 (1903).

W. Kansu and W. Szechwan.—In bogs, 3300–3860 m.—Licent 4794 ; Wilson (Veitch Exped.) 4141a, 4142.

55. *G. Farreri* Balf. fil. in Trans. Proc. Bot. Soc. Edinb. 27, 248 (1918) ; Marquand in Journ. Roy. Hort. Soc. 57, 198 (1932) ; Wilkie, Gentians, 61, fig. 32, 33 (1936).

N.E. Tibet, Kansu and N.W. Szechwan.—On mountains, 4100–4500 m.—*Ching* 986 ; *Cunningham* 303 ; *Farrer* sine no. ; *French Ridley* 21 ; *Kingdon-Ward* 4859 ; *Rock* 14862.

56. *G. sino-ornata* Balf. f. in Trans. Proc. Bot. Soc. Edinb. **27**, 253 (1918) ; Marquand in Journ. Roy. Hort. Soc. **57**, 197 (1932) ; Wilkie, Gentians, 125, fig. 66, 67 and frontispiece (1936).

N.W. Yunnan, S.W. Szechwan, S.E. Tibet and N.W. Upper Burma.—In moist alpine meadows, 2400–5000 m.—*Farrer* 1400 ; *Forrest* 408, 3028, 6728, 7374, 13549, 15114, 15186, 15355, 22486, 22602 ; *Kingdon Ward* 101 McLaren "N" 220 ; *Schneider* 384, 2699 ; *Rock* 7769, 7771, 10816, 10842, 10874, 11400, 11478, 11570, 11668, 17244, 17355.

forma **alba** (*Forrest*) *Marquand*, stat. nov. floribus albis tantum distincta.—*G. ornata* var. *alba* *Forrest* in Notes Roy. Bot. Gard. Edin. **4**, 72 (1907).

Yunnan.—Yangtze-Mekong divide, 4200 m.—*Forrest* 24, 408, 11447 ; *Rock* 11568.

var. **punctata** *Marquand* in Kew Bull. 1931, 84.

N.W. Yunnan and N.E. Upper Burma.—In open moist stony alpine meadows, 3400–4500 m.—*Forrest* 22602, 25423, 27450, 27749 ; *Kingdon Ward* 7586 ; *Rock* 18346.

var. **gloriosa** *Marquand* in Kew Bull. 1928, 57.

S.W. Szechwan.—Mountains east of Yungning, 27° 50' N., 100° 56' E., 3400–3600 m.—*Forrest* 20640.

57. *G. helophila* Balf. f. et *Forrest* ex *Marquand* in Kew Bull. 1928, 60.

N.W. Yunnan.—Lei-lung-shan.—*Forrest* 15187.

Ser. iii. SUBORBISEPALAE *Marquand*, series nova.

Perennes ; folia opposita, laxa ; flores solitarii, terminales ; calycis lobi suborbiculares vel spathulati ; corollae tubus fauce constrictus.

58. *G. stragulata* Balf. f. et *Forrest* ex *Marquand* in Kew Bull. 1928, 61 ; *Marquand* in Journ. Roy. Hort. Soc. **57**, 200 (1932) ; Wilkie, Gentians, 129, fig. 70 (1936).

N.W. Yunnan and S.E. Tibet.—In moist stony moorland and peaty pastures, 3000–4000 m.—*Forrest* 12890, 13318, 14636, 14872, 19060, 19224, 21008 ; *Monbeig* sine no. ; *Rock* 11595, 18344.

59. *G. tongolensis* Franch. in Bull. Soc. Bot. France, **43**, 490 (1896).

S.W. Szechwan and N.W. Yunnan.—Muli and the Mekong-Salwin divide ; in meadows, 3950 m.—*Cunningham* 341 ; *Forrest* 13371 ; *Kingdon Ward* 4691, 4722, 4804 ; *Rock* 18238 ; *Soulié* 203.

60. *G. suborbisepala* *Marquand* in Kew Bull. 1928, 58.

S.W. Szechwan.—Tongolo and Litang-Yalung divide, on open shrub-clad slopes, 3600–4100 m.—*Cunningham* 312 ; *Kingdon Ward* 4941 ; *Rock* 16758.

Ser. iv. CONFERTIFOLIAE *Marquand*, series nova.

Perennes; folia opposita, imbricata, latiora, margine cartilagineo; flores solitarii, terminales; corollae tubus fauce haud constrictus.

61. *G. confertifolia* *Marquand* in Kew Bull. 1928, 50.

N.W. Yunnan.—Yungning, on sunny limestone cliffs, 3000–3400 m.—*Kingdon Ward* 5058.

62. *G. Georgei* *Diels* in Notes Roy. Bot. Gard. Edinb. 5, 221 (1912); *Marquand* in Journ. Roy. Hort. Soc. 57, 199 (1932); *Wilkie*, *Gentians*, 69, fig. 35, 36 (1936).

Yunnan and S.E. Tibet.—In open stony pastures and alpine moorland, 2000–4800 m.—*Farrer* 267; *Forrest* 3110, 7355, 11464, 15185, 22984; *Kingdon Ward* 104, 1133, 4988; *Rock* 11409, 11655, 17264, 17329, 18530.

63. *G. Szechenyii* *Kanitz*, Pl. Exped. Széchenyi in As. Centr. coll. 40 (1891); *Kusnez*, Monogr. 267.—*G. rosularis* *Franch.* in Bull. Soc. Philom. Paris, Sér. 8, 3, 148 (1891). *G. callistantha* *Diels* et *Gilg* in *Futterer*, *Durch Asien*, Bot., reimpr. 14 (1903).

W. Szechwan.—*Wilson* (*Veitch* Exped.) 4145.

64. *G. tizuensis* *Franch.* in Bull. Soc. Bot. France, 43, 494 (1896).

W. Szechwan.—Tizou and Tongolo.—*Cunningham* 314; *Kingdon Ward* 5398; *Soulié* 368.

Ser. v. UNIFLORAE *Marquand*, series nova.

Perennes; caudex crassus; folia opposita, imbricata, latiora; calycis lobi haud in basin attenuati; flores solitarii, terminales; corollae tubus fauce haud constrictus sed leviter expansus.

65. *G. phyllocalyx* *C. B. Clarke* in Hook. f. Fl. Brit. Ind. 4, 116 (1883); *Kusnez*, Monogr. 288; *Wilkie*, *Gentians*, 100, fig. 55 (1936).

N.W. Yunnan, S.E. Tibet (Tsarong) and N.E. Upper Burma.—Open moist alpine meadows and moist moorlands, 3900–4500 m.—*Farrer* 1148, 1703; *Forrest* 401, 402, 3831, 3832, 7130, 14276, 14682, 14826, 19816, 20227, 20612, 22301, 22782, 22786, 26957; *McLaren* "N" 83; *Monbeig* sine no.; *Kingdon Ward* 859, 945, 4240, 4665, 5387; *Rock* 9680, 16863.

66. *G. filistyla* *Balf. f. et Forrest ex Marquand* in Kew Bull. 1928, 60.

N.W. Yunnan and S.E. Tibet.—Yangtze-Mekong and Mekong-Salwin divides, and Ka-gwr-pu in Tsarong, on moist stony pastures, up to 4500 m.—*Forrest* 14338, 14561, 16882; *Rock* 10342.

67. *G. Wardii* *W. W. Sm.* in Notes Roy. Bot. Gard. Edinb. 7, 122 (1913).

N.W. Yunnan and S.E. Tibet.—In marshy, boggy moorland, 4500 m.—*Forrest* 13165, 14560, 16874, 19057, 19980, 20280 ; *Kingdon Ward* 103, 5335.

68. *G. emergens* Marquand in Kew Bull. 1931, 82.

S.W. Szechwan.—Mount Mitzuga, west of Muli Gomba, on rocks and boulders, 3050–4875 m.—*Rock* 16591.

69. *G. altigena* H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. **63**, 99 (1926) (*Hand.-Mazz. Pl. Nov. Sin. Fortsetz.* **40**, 5) ; et in *Hand.-Mazz. Symb. Sin.* **7**, 972 (1936).

N.W. Yunnan.—On the Salwin-Irrawaddi divide, on mountain slopes of Gomba-la above Tschamatong towards the pass of Tsukue, above 4200 m.—*Handel-Mazzetti* 9878.

Ser. vi. SIKKIMENSES *Marquand*, series nova.

Perennes ; flores numerosi, \pm congesti ; folia radicalia conspicua ; folia caulina opposita.

70. *G. chinensis* Kusnez. in Mém. Biol. **13**, 338 (1892), et in Bull. Acad. Pétersb. **35**, 350 (1894) ; Kusnez. Monogr. 277.

W. Szechwan.—Mount Omei summit, Wushan summit, in woodland glades, and stony places.—*Faber* 294 ; *Fang* 2847 ; *Henry* 8867 ; *Maire* sine no. ; *Pratt* 154, 159, 435 ; *Wilson* (Veitch Exped.) 4127, 5107 ; (Arn. Arb. Exped.) 2454 ; *Rock* 17323.

71. *G. Harrowiana* Diels in Notes Roy. Bot. Gard. Edinb. **5**, 22 (1912).

Yunnan.—Tali range, on open rocky mountain pastureland, 3400–3600 m.—*Farrer* 1889 ; *Forrest* 3825.

72. *G. sikkimensis* C. B. Clarke in Hook. f. Fl. Brit. Ind. **4**, 114 (1883) ; Kusnez. Monogr. 276 ; Marquand in Journ. Roy. Hort. Soc. **57**, 200 (1932) ; Wilkie, Gentians, 123, fig. 69 (1936)—*G. pseudo-sikkimensis* Marquand ex Wilkie loc. cit. 163.

Yunnan and S.E. Tibet.—On open moist stony slopes and moist pinewoods, 5000 m.—*Farrer* 1401 ; *Forrest* 55, 3829, 6878, 19050, 20319.

73. *G. streptopoda* Balf. f. et Forrest ex Marquand in Kew Bull. 1928, 61.

N.W. Yunnan and N.E. Upper Burma.—Tali Range, Mekong-Yangtze divide and N' Maikha-Salwin divide, in moist alpine meadows, 4500 m.—*Delavay* 139 ; *Forrest* 14827, 27451, 27544 ; *Schneider* 3052 ; *Rock* 6322.

Ser. vii. MULTIFLORAE *Marquand*, series nova.

Perennes ; flores numerosi ; folia radicalia nulla.

74. *G. microdonta* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 130 (1890) ; Kusnez. Monogr. 272 ; Wilkie, Gentians, 89, fig. 44.—*G. phyllopoda* Lévl. in Bull. Géogr. Bot. **24**, 21 (1915).

S. Szechwan and Yunnan.—Mount Omei, Lichiang Snow Range and Tsangshan, 2500–3500 m.—*Delavay* sine no.; *Faber* 46; *Forrest* 410, 2957, 3826, 6471, 6826, 10867, 14524; *Kingdon Ward* 971; *McLaren* "N" 138; *Monbeig* 193; *Wilson* 1028; *Rock* 5268, 6361.

75. *G. melandriifolia* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 129 (1890).

Yunnan.—On the Tang-shan, 2500–3900 m.—*Delavay* 1235; *Forrest* 3013, 3048, 7201, 11719; *Schneider* 2776, 3247. A specimen collected at an altitude of 3000 m. on the Tsang near Tali in Aug. 1914 by *Schneider* (3074a) appears to be a hybrid of this species with *G. rigescens* Franch.

76. *G. Duclouxii* Franch. in Bull. Soc. Bot. France, **46**, 305 (1899).

Yunnan.—On the hills north-west of Yunnanfu lake, 2100 m.—*Bodinier* in Herb. *Léveillé* 2548; *Ducloux* 320, 588, 673; *Forrest* 470, 701; *Maire* 753.

77. *G. rigescens* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 134 (1890); *Kusnez. Monogr.* 235; *Marquand* in Journ. Roy. Hort. Soc. **57**, 201 (1932); *Wilkie, Gentians*, 112, fig. 62, 63. *G. Esquirolii* Lévl. in Fedde, *Repert.* **12**, 183 (1913); *G. Vaniotii* Lévl. l.c. 182.

Yunnan.—*Bodinier* 31, et sine no.; *Delavay* 142; *Esquirol* 194, 701; *Forrest* 1048, 3091, 6823; *Maire* 1508; *Rock* 7213; *Schneider* 2525, 2728.

var. *stictantha* *Marquand*, var. nov.; a typo differt corollis punctatis.

Yunnan.—*Cavalerie* 421, 8253; *Ducloux* 151; *Forrest* 9224.

var. *violacea* *H. Sm.* in Hand.-Mazz. *Symb. Sin.* **7**, 976 (1936).

Yunnan.—*Rock* 7805; *Schneider* 2775; *Tsang* 6909.

This species was placed in Section *Pneumonanthe* by Franchet, and retained there by Kusnezow in his Monograph of *Eugentiana*, but the seeds clearly show that it belongs to Section *Frigida*, where it is allied to *G. cephalantha* Franch.

78. *G. cephalantha* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 125 (1890), *Kusnez. Monogr.* 274; *Wilkie, Gentians*, 49, fig. 63—*G. pseudocephalantha* *Marquand* ex *Wilkie, "Gentians"* 163 nomen.

Yunnan, W. Szechwan and N.E. Upper Burma frontier.—In alpine meadows, 3000–3600 m.—*Delavay* sine no.; *Farrer's orderly* 1391; *Forrest* 28, 700, 2990, 3007, 7221, 7369, 10502, 11362; *McLaren* "N" 221; *Maire* 911, 912, 1519; *Wilson* (Veitch Exped.) 4128.

79. *G. Davidi* Franch. Pl. David. 211 (1884); *Kusnez. Monogr.* 273.

Fukien and S.W. Chekiang.—On open mountain slopes.—*Carles* 676 ; *Cavalerie* 365 ; *David* sine no. ; *Price* 1162.

80. *G. Atkinsonii* *Burkill* in Journ. Proc. As. Soc. Beng. n.s. 2, 309 (1906).

Kwangtung.—Lofui mountains, 1000 m.—*Atkinson* 322.

81. *G. wasenensis* *Marquand* in Kew Bull. 1931, 80.

W. Szechwan.—Wen-chuan-sen, in alpine meadows, 3000–3600 m.—*Wilson* (Arn. Arb. Exped.) 2457.

82. *G. Purdomi* *Marquand* in Kew Bull. 1928, 55.

W. Kansu.—Minchow, 2700–3000 m.—*Purdom* sine no.

83. *G. Chingii* *Marquand* in Kew Bull. 1931, 83.

Kansu.—Ye Cheou K'ou near Old Taochow on the border of Tibet, 3300–3800 m., in dense tussocks, very common.—*Ching* 817.

84. *G. trichotoma* *Kusnez.* in Act. Hort. Petrop. 13, 61 (1893); *Kusnez. Monogr.* 281 ; *Marquand* in Journ. Roy. Hort. Soc. 57, 201 (1932); *Wilkie, Gentians*, 135, fig. 80. *G. Phob* *Franch.* in Bull. Soc. Bot. France, 43, 493 (1896).

Kansu, W. Szechwan, Shensi, E. Tibet and Yunnan.—*Cunningham* 280, 307 ; *Farrer* 220 ; *Giraldi* sine no. ; *Limpricht* 2282 ; *Kingdon Ward* 4251 ; *Maire* sine no. ; *Pratt* 469 ; *Rock* 16575, 16625, 16689, 16759, 16796, 17413, 17921, 18202, 18511 ; *Wilson* (Veitch Exped.) 4138a ; (Arn. Arb. Exped.) 1028.

var. *brevicaulis* *Marquand* in Kew Bull. 1931, 82.

N.W. Yunnan.—On the Peima-shan, Mekong-Yangtze divide, between Atuntze and Pangtzel, 4200–4500 m.—*Rock* 10033.

85. *G. Przewalskii* *Maxim.* in Bull. Acad. Pétersb. 27, 502 (1881); *Marquand* in Journ. Roy. Hort. Soc. 57, 202 (1932); *Wilkie, Gentians*, 105, fig. 61. *G. algida* var. *Przewalskii* *Kusnez. Monogr.* 265.

Kansu, W. Szechwan and E. Tibet.—On bare mountains.—*Ching* 934, 945 ; *Cunningham* 302 ; *Farrer* 703 ; *Hosie* sine no. ; *Licent* 4661, 4795 ; *Przewalski* sine no. ; *Rock* 13011, 13720, 13734, 14645.

86. *G. apiata* *N. E. Brown* in Kew Bull. 1914, 187.

Shensi.—Tai-pei-shan.—*Purdom* 406.

87. *G. Wilsoni* *Marquand* in Kew Bull. 1928, 59.

W. China.—In alpine meadows.—*Wilson* (Veitch Exped.) 4138.

88. *G. atuntsiensis* *W. W. Sm.* in Notes Roy. Bot. Gard. Edinb. 7, 121 (1913).

S.W. China.—*Monbeig* sine no.

This species has been collected subsequently outside this area by Capt. Kingdon Ward at Suiden Gomba, Nagong, Tibet, at an

altitude of 14000–15500 feet (4200–4500 m.), 18 Aug. 1933, no. 10767.

89. *G. Handelianana* H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, **63**, 98 (Hand.-Mazz. Pl. Nov. Sin., Fortsetz. **40**, 4); et in Hand.-Mazz. Symb. Sin. **7**, 972 (1936).

N.W. Yunnan.—Doker La on the Tibetan border, on granite and mica-schist, 4050–4600 m.—*Handel-Mazzetti* 9895.

90. *G. stictantha* Marquand in Kew Bull. 1928, 57; Wilkie, Gentians, 128, fig. 68.

S.E. Tibet.—Doker La, on alpine turf, 4200–4500 m.—*Kingdon Ward* 1134.

Ser. viii. ANNUAE *Marquand*, series nova.
Plantae annuae.

Subser. 1. TETRAMERAE *Marquand* subser. nov.
Calyx 4-lobatus.

91. *G. lineolata* Franch. in Bull. Soc. Bot. France, **31**, 375 (1884); Kusnez. Monogr. 287.

Yunnan.—On open hillsides, 600–3500 m.—*Bodinier in Herb. Léveillé* sine no.; *Cavalerie* 4673, 4674; *Delavay* sine no.; *Ducloux* 505; *Forrest* 11380, 11523, 15192, 17131; *Maire in Herb. Léveillé* sine no.; *Rock* 10880, 11474, 17344, 17346, 18284.

92. *G. praeclara* Marquand in Kew Bull. 1928, 54; et in Journ. Roy. Hort. Soc. **57**, 202 (1932).

S.W. Szechwan.—Muli mountains, in open alpine meadows, 2400–4200 m.—*Forrest* 17075; *Kingdon Ward* 9868.

Subser. 2. PENTAMERAE *Marquand* subser. nov.
Calyx 5-lobatus.

93. *G. picta* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 131 (1890); Kusnez. Monogr. 285; Marquand in Journ. Roy. Hort. Soc. **57**, 203 (1932).

Yunnan.—Heechanmen, above Lankong, 2800 m.—*Delavay* 135; *Ducloux* 646; *Forrest* 354, 413, 13555, 17112; *Rock* 18283; *Schneider* 3695.

94. *G. Blinii* Lévl. in Bull. Géogr. Bot. **25**, 22 (1915).

Yunnan.—Near Lichiang, in alpine meadows, 4000 m.—*Ducloux in Herb. Bonati* 1432; *Kingdon Ward* 4840; *Maire in Herb. Bonati* 3974, 7403, 7410; *Schneider* 2433.

95. *G. yunnanensis* Franch. in Bull. Soc. Bot. France, **31**, 376 (1884); Kusnez. Monogr. 285.

Kwei-chow, Yunnan and S.E. Tibet.—In alpine meadows, 2500–3500 m.—*Delavay* 136, 1671; *Ducloux* in *Herb. Bonati* 1436, 2742; *Forrest* 30, 407, 3019, 3082, 6727, 11187, 11467, 11477, 13243, 15001; *McLaren* "N" 222, 224; *Maire* in *Herb. Bonati* 2738, 3973, 7405, 7406, 7407; *Maire* in *Herb. Léveillé* sine no.; *Rock* 7784, 10710, 10757, 10767, 10821; *Schneider* 2627, 2629, 3705, 3780; *Tsiang* 9147.

var. *kialensis* *Marquand*, var. nov.; a typo planta e basi ramosa habitu \pm decumbente, foliis sepalisque angustioribus recedit.

W. SZECHWAN. Sikang: Taofu (Dawo) district; Taining (Ngata), between Taining and Yara pass, on dampish gravel by a stream, 3700 m., Sept. 3, 1934, *H. Smith* 11734; Taining (Ngata), on the gravelly bank of a stream 3700 m., Sept. 9, 1934, *H. Smith* 11999. Between Taining (Ngata) and Maoniu (Ndrömé); between Djadji la and the village Tjedji, on a gravelly slope, 3800 m., Sept. 30, 1934, *H. Smith* 12493.

S. E. TIBET. Kiala: Tongolo, Soulié 680.

This variety in certain respects approaches *G. tongolensis* and *G. suborbisepala* (Series *Suborbisepalae*), but as pointed out by Dr. Harry Smith (in litt. 11/12/36) its true affinities appear to be with *G. yunnanensis* (Series *Annuae*).

Sect. IV. *APTERA* *Kusnez.* in *Act. Hort. Petrop.* 13, 62 (1893); *Marquand* in *Journ. Roy. Hort. Soc.* 57, 203 (1932).

96. *G. gracilipes* *Turrill* in *Bot. Mag.* t. 8630 (1915); *Marquand* in *Journ. Roy. Hort. Soc.* 57, 204 (1932); *Wilkie*, *Gentians*, 74, fig. 39.

Kansu.—Tao river basin.—*Rock* 13175, 13719. Cultivated from seed collected by *Purdom*. This species was grown under the manuscript name *Gentiana Purdomii* and was figured under that name, without a technical description, in *Gard. Chron.* ser. 3, 81, 143 (Feb. 26, 1927). The reference in the text (p. 144) being merely a description of the habit, does not validate the publication of the name. Hence *G. Purdomi* *Marquand* (1928) stands.

97. *G. dahurica* *Fisch.* in *Mém. Soc. Nat. Mosc.* 3, 63 (1812); *Kusnez.* *Monogr.* 318; *Wilkie*, *Gentians*, 55.—*G. Kurroo* var. *brevidens* *Maxim.* ex *Kusnez.* in *Bull. Acad. Pétersb.* 34, 508 (1892).

Kansu and N. China.—*Ching* 529, 1090; *Licent* 923, 4571, 4573, 4823; *Limpricht* 3041; *Meyer* 1116; *Przewalski* sine no.; *Purdom* 4955.

98. *G. siphonantha* *Maxim.* ex *Kusnez.* in *Mél. Biol.* 13, 176 (1891 vel 1892); et in *Bull. Acad. Pétersb.* 34, 506 (1892); *Kusnez.* 316; *Wilkie*, *Gentians*, 126.

Kansu and N.E. Tibet.—On exposed moist foothills, 2650–3100 m.—*Farrer* 579; *Farrer and Purdom* sine no.; *French Ridley* 38; *Przewalski* sine no.

var. *latifolia* Marquand, var. nov.; a typo differt foliis latioribus usque ad 2.5 cm. latis, floribus pedunculatis.

Kansu.—Lan-ze-cheou K'ou near Sining.—On exposed moist foothills, 2650–3100 m.—*Ching* 585.

99. *G. macrophylla* Pall. Fl. Ross. 2, 108 (1788); Kusnez. Monogr. 326; Wilkie, Gentians, 86, fig. 45.—*G. quinquenervia* Turrill in Kew Bull. 1914, 328.

Hopei, Shansi, Kansu and W. Szechwan.—On uplands, 2100–3600 m.—*Bodinier* 39, et sine no. in *Herb. Léveillé*; *Chanet* 919; *Licent* 576; *Purdom* sine no.; *Rock* 13179; *Wilson* 753, 807.

100. *G. Fetisowi* Regel et Winkler in Act. Hort. Petrop. 7, 548 (1880); et in Gartenfl. 31, 3, t. 1069, fig. 1–5 (1882); Kusnez. Monogr. 324; Wilkie, Gentians, 64.—*G. Potanini* Maxim. in Herb. Petrop., teste Kusnez. in Act. Hort. Petrop. 15, 324 (1904).

Kansu and N. Szechwan.—*Potanin* (Herb. Petrop.).

101. *G. pseudodecumbens* H. Sm. in Kew Bull. 1937, 130.

Chihli.—On hills, 1600 m.—*Limpricht* 593; *H. Smith* 1040.

102. *G. biflora* Kusnez. in Act. Hort. Petrop. 13, 62 (1893); Kusnez. Monogr. 321.

Kansu.—Raised in the Leningrad Botanical Garden from seed collected by Przewalski in the western part of the province. No wild specimens seen.

103. *G. straminea* Maxim. in Bull. Acad. Pétersb. 27, 502 (1881); et Mém. Biol. 11, 265; Kusnez. Monogr. 323; Marquand in Journ. Roy. Hort. Soc. 57, 207 (1932); Wilkie, Gentians, 130, fig. 75.

W. Kansu.—Tangut and Sie kia t'ai.—*Ching* 682; *Fang* 4347, 4383; *Farrer* 612; *Licent* 4572; *Przewalski* sine no.; *Rock* 13715.

104. *G. wutaiensis* Marquand in Kew Bull. 1931, 80.

Shansi.—Wu-tai-shan, on mountain slopes in the alpine region, 1800–3000 m.—*Hancock* (Kew no.) 62; *Ling* 9400; *Tang* 1110.

105. *G. officinalis* H. Sm. in Hand.-Mazz. Symb. Sin. 7, 979 (1936).

N.W. Szechwan and W. Kansu.—On mountain sides, 3100–3900 m.—*Ching* 753, 807; *H. Smith* 4100, 4135; *Weigold* sine no.

106. *G. dendrologi* Marquand in Kew Bull. 1931, 79.

W. China.—In alpine meadows and grasslands, 3000–3400 m.—*Wilson* (Veitch Exped.) 4125, 4130.

The author is unable to agree with Dr. Harry Smith in reducing this species to *G. straminea* Maxim. The habit of the inflorescence, as well as the much shorter corolla and sessile flowers, seem to justify its separation, though it is certainly allied to that species.

107. *G. crassicaulis* Duthie ex Burkill in Journ. Proc. As. Soc. Beng. n.s. **2**, 311 (1906); Marquand in Journ. Roy. Hort. Soc. **57**, 206 (1932); Wilkie, Gentians, 53.

Yunnan and W. Szechwan.—Lichiang Range and neighbourhood, in alpine grassland, 2500–3400 m.—*Delavay* 1241 ; *Forrest* 6555 ; *Pratt* 463 ; *Rock* 5901 ; *Soulié* 675 ; *Wilson* 4131.

Sect VII. **PNEUMONANTHE** (*Neck.*) *Link em. Kusnez.* in Act. Hort. Petrop. **15**, 179 (1898); Marquand in Journ. Roy. Hort. Soc. **57**, 207 (1932).

108. *G. scabra* Bunge, Verz. Altai ges. Pfl. **21** (1836); *em. Maxim.* in Mél. Biol. **12**, 759 (1888); Marquand, l.c. 208.—*G. scabra* var. *Burgeana* Kusnez. Monogr. 220.

Kiukiang and Hupeh.—*Carles* 131, 147, 491; *Wilson* (Veitch Exped.) 2666.

var. **Fortunei** (*Hook.*) *Maxim.* in Mél. Biol. **12**, 759 (1888); Kusnez. Monogr. 222.—*G. Fortunei* Hook. in Bot. Mag. t. 4776 (1854). N. China.—*Fortune* sine no.

Sect. VIII. **ISOMERIA** *Kusnez.* in Act. Hort. Petrop. **15**, 339 (1904); Marquand in Journ. Roy. Hort. Soc. **57**, 208 (1932).

109. *G. Delavayi* Franch. in Bull. Soc. Bot. France, **31**, 377 (1884); Marquand, l.c.

Yunnan.—*Bodinier* in Herb. Lévillé sine no.; *Delavay* sine no.; *Ducloux* 503; *Forrest* 309, 6741, 7372, 11499, 21015; *Kingdon Ward* 4993; *McLaren* "N" 234; *Maire* 1515; *Rock* 17343, 17350; *Schneider* 2582, 3711.

This species exhibits a considerable range in habit and form of the leaves, but all the forms intergrade and there seems little justification for distinguishing a number of subdivisions such as the forma *caulescens* Franch.

Sect. IX. **CHONDROPHYLLA** *Bunge em. Kusnez.* in Act. Hort. Petrop. **15**, 344 (1898); Marquand in Journ. Roy. Hort. Soc. **57**, 210 (1932).

Ser. i. **PUBIGERAE** *Marquand*, series nova.

Caulis, folia, et calyx pubescentia.

110. *G. pubigera* Marquand in Kew Bull. 1928, 59.—*G. puberula* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 132 (1890); Kusnez. Monogr. 422; non Michx. (1803).

Yunnan and S. Szechwan.—In pastures and roadsides, 3000 m.—*Delavay* 2631; *Forrest* 2067.

var. **glabrescens** *H. Sm.* in Hand.-Mazz. Symb. Sin. **7**, 961 (1936).

Szechwan.—Sandao-shan between Yenyuen and Yalung, grassy places, 2400–3300 m.—*Handel-Mazzetti* 2206.

Ser. ii. FIMBRIATAE *Marquand*, series nova.

Plicae fimbriatae.

111. *G. Reynieri* *Lévl.* in Bull. Géogr. Bot. **25**, 22 (1915).—*G. robustior* Burkill ex Diels in Notes Roy. Bot. Gard. Edinb. **7**, 196 (1912), nomen.

W. Hupeh and Yunnan.—Talifu, Tengyueh and Lan-Ngi-Tsin, 2000—3000 m.—*Maire* in *Herb. Léveillé*; *Forrest* 7609; *Schneider* 2689.

112. *G. grata* *H. Sm.* in Anz. Akad. Wiss. Wien, Math.-Nat. **63**, 103 (1926) (*Hand.-Mazz. Pl. Nov. Sin.*, Fortsetz. **40**, 9); et in *Hand.-Mazz. Symb. Sin.* **7**, 969 (1936).

N.W. Yunnan.—Salwin-Irrawaddi divide, 4050 m.—*Handel-Mazzetti* 9898.

113. *G. burmensis* *Marquand* in Kew Bull. 1928, 49.

N.E. Burma.—Chaw-Chi pass, very local, but abundant in mossy pine slopes in open glades, and on open but sheltered moss-covered cliffs of a ridge of igneous rocks, 2700—3600 m.—*Farrer* 1850; *Kingdon Ward* 1900.

114. *G. formosa* *H. Sm.* in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, **63**, 104 (*Hand.-Mazz. Pl. Nov. Sin.*, Fortsetz. **40**, 10); et in *Hand.-Mazz. Symb. Sin.* **7**, 970 (1936).

N.W. Yunnan and S.E. Tibet.—Between the Salwin and Irrawaddi and on the Salwin-Kiuchiang divide, in marshy places, 4050 m.—*Forrest* 20272; *Handel-Mazzetti* 9896.

forma *albiflora* *H. Sm.* in *Hand.-Mazz. Symb. Sin.* **7**, 970 (1936).

Yunnan.—On mountain sides near the boundary of Tibet and Burma, Gomba la near the pass of Tsukue, above 4200 m.—*Handel-Mazzetti* 9874.

115. *G. saltuum* *Marquand* in Kew Bull. 1928, 55.

N.E. Burma.—Moku-je Pass, in damp open grassy places among the cane brakes.—*Farrer* 1795.

116. *G. oligophylla* *H. Sm.* in Kew Bull. 1937, 130.

W. Hupeh.—Fang Hsien.—Uplands, 2100—2400 m.—*Wilson* (Arn. Arb.) 4662.

117. *G. panthaica* *Burkill* in Journ. Proc. As. Soc. Beng. n.s. **2**, 313 (1906).—*G. recurvata* C. B. Clarke sec. Hemsl. in Journ. Linn. Soc., Bot. **26**, 133 (1890), non C. B. Clarke (1883).

Yunnan and Szechwan.—Lichiang, Yen-tze-hay, in meadows.—*Delavay* sine no.; *Forrest* 2349, 5892; *Limpricht* 1057; *Rock* 4686.

118. *G. epichysantha* *Hand.-Mazz.* in Anz. Akad. Wiss. Wien, Math.-Nat. 1920, **57**, 173 (*Hand.-Mazz. Pl. Nov. Sin.*, Fortsetz.

5, 2).—*G. panthaica* var. *epichysantha* (Hand.-Mazz.) H. Sm. in Hand.-Mazz. Symb. Sin. 7, 966 (1936).

Yunnan and N.E. Upper Burma, 3000–3925 m.—*Forrest* 24703, 24961; *Handel-Mazzetti* 4546.

Ser. iii ORBICULATAE *Marquand*, series nova.

Calycis lobi ovato-lanceolati, recurvati.

119. *G. intricata* Marquand, nom. nov.—*G. fastigiata* Franch. in Bull. Soc. Bot. France, 31, 373 (1884), non Benth. (1844); Kusnez. Monogr. 409.

Yunnan.—Above Schuidsai and Tali, Langkong and Hee-gui-chao.—*Delavay* 21; *Forrest* 109, 15101; *Schneider* 2169.

120. *G. Jamesii* Hemsl. in Journ. Linn. Soc., Bot. 26, 128 (1890); Kusnez. Monogr. 284.

Korea.—*James* sine no.

121. *G. crassuloides* Bur. et Franch. in Morot, Journ. de Bot. 5, 104 (1891); Kusnez. Monogr. 414; *Marquand* in Journ. Roy. Hort. Soc. 57, 211 (1932).

Shensi and W. Szechwan.—Grasslands, 3000–3600 m.—*Giraldi* sine no.; *Pratt* 250, 603; *Purdom* sine no.; *Wilson* (Veitch Exped.) 4132.

122. *G. pseudosquarrosa* H. Sm. in Hand.-Mazz. Symb. Sin. 7, 963 (1936).

Szechwan and N.W. Yunnan.—In open places, and in meadows, 1800–3500 m.—*Limpricht* 1207; *H. Smith* 2300; *Soulié* 2802; *Wilson* 4133.

123. *G. Crassula* H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, 63, 104 (Hand.-Mazz. Pl. Nov. Sin., Fortsetz. 40, 10); et in Hand.-Mazz. Symb. Sin. 7, 963 (1936)—*G. calcicola* Marquand ex Wilkie, Gentians, 150, nomen.

S. Szechwan.—In the Muli district and on the Litang-Yalung divide, on limestone cliffs, 3500–4200 m.—*Delavay* 3364; *Handel-Mazzetti* 7171; *Kingdon Ward* 4475.

124. *G. squarrosa* Ledeb. in Mém. Acad. Pétersb. 5, 527 (1812); Kusnez. Monogr. 410.

N. China, from near Peiping to Central Shansi.—On hillsides.—*Bretschneider* 508; *Licent* 940, 1040, 2127; *Przewalski* sine no.; *Schneider* 11.

Ser. iv. LINEARIFOLIAE *Marquand*, series nova.

Folia caulina linearia vel subulata, elongata, angustissima.

125. *G. faucipilosa* H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, 63, 102 (Hand.-Mazz. Pl. Nov. Sin., Fortsetz. 40, 8); et in Hand.-Mazz. Symb. Sin. 7, 959 (1936).

Yunnan.—Gumbala, on the Tibetan frontier, Salwin-Irrawaddi divide, 2300–3100 m.—*Handel-Mazzetti* 9872.

var. *caudata* *Marquand*, var. nov., a typo differt corollae lobis caudatis.

Yunnan and Szechwan.—*Cunningham* 265 ; *Forrest* 13865.

Note. This species appears to hybridize or intergrade with *G. scariosa* (no. 128). *Cunningham* 311, collected in Western Szechwan, is an example of an intermediate form.

126. *G. cuneibarba* H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. 1926, **63**, 102 (Hand.-Mazz. Pl. Nov. Sin., Fortsetz. **40**, 8); et in Hand.-Mazz. Symb. Sin. **7**, 958 (1936).

N.W. Yunnan.—Near the Salwin, in open grassy localities, 3150 m.—*Handel-Mazzetti* 9610.

127. *G. asterocalyx* Diels in Notes Roy. Bot. Gard. Edinb. **5**, 220 (1902).

Yunnan.—Lichiang Range, in woods and mountain pastures.—*Forrest* 2415, 5652, 6131, 22201A ; *Rock* 4929, 10495 ; *Schneider* 2008, 2339.

128. *G. scariosa* Balf. f. et Forrest in Notes Roy. Bot. Gard. Edinb. **4**, 74, t. 15 (1907).

Yunnan.—Descent from Niuchang Pass to Chungtien plateau, in open grassy places in pine woods, 3900–4200 m., *Cunningham* 311 ; *Forrest* 404, 15188 ; *Kingdon Ward* 4990 ; *Maire* sine no.

129. *G. aristata* Maxim. in Bull. Acad. Pétersb. **26**, 497 (1880); Mém. Biol. **10**, 678 ; Kusnez. Monogr. 390.

Kansu and N.E. Tibet.—S.W. of Sining, Shang-sin-chuang, 2700 m.—*French Ridley* 12 ; *Learner* sine no.; *Przewalski* sine no.

130. *G. linoides* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 129 (1890); Kusnez. Monogr. 392.

Yunnan.—Koua-la-po, near Hokin.—*Delavay* sine no.

131. *G. choanantha* Marquand in Kew Bull. 1931, 85.

W. Szechwan and E. Tibet.—Near Tatsienlu and Kiala, Tongolo, on grassy slopes, 2700–4120 m.—*Pratt* 512 ; *Rock* 17485 ; *Soulié* 877 ; *Wilson* (Veitch Exped.) 4140a.

Ser. v. RUBICUNDÆ *Marquand*, series nova.

Flores magni (usque ad 5 cm. longi), carmesini.

132. *G. purpurata* Maxim. in Bull. Acad. Pétersb. **34**, 506 (1892); Kusnez. Monogr. 392.

W. Szechwan.—East of Sungpan Ting, 2400–2700 m.—*Potanin* sine no.; *Wilson* (Arn. Arb. Exped.) 4703 ; (Veitch Exped.) 4137, 4138a.

133. *G. rubicunda* Franch. in Bull. Soc. Bot. France, **31**, 373 (1884); Kusnez. Monogr. 393.

Yunnan, Hupeh and Szechwan.—*Bodinier* 1343; *Delavay* sine no.; *Esquirol* 2076; *Henry* 304, 462, 717, 3718, 5234, 5629, 6872, 6872a; *Potanin* sine no.; *Pratt* 92, 778, 5708; *Wilson* (Veitch Exped.) 37.

var. ***delicata* (Hance) Marquand** stat. nov.—*G. delicata* Hance in Journ. Bot. 1883, 324; Kusnez. Monogr. 405.

Fukien, Hupeh and W. Szechwan.—Under bamboos in the first mentioned province, on roadsides, etc., in those further north-west.—*Dunn's collector* 1440; *Henry* 233, 5456, 5456b; *Pratt* 367; *Wilson* (Veitch Exped.) 745.

var. ***samolifolia* (Franch.) Marquand**, stat. nov.—*G. samolifolia* Franch. in Bull. Soc. Bot. France, **43**, 485 (1896).

Hupeh.—Patung district.—*Farges* 948, 1052; *Henry* 5456a.

var. ***bellidifolia* [(Franch.) Marquand** stat. nov.—*G. bellidifolia* Franch. in Bull. Soc. Bot. France, **43**, 486 (1896), non Hook.f. (1844).

Hupeh, Szechwan and probably Kweichow.—Near "Tchen-kéoutin".—*Cavalerie* 3587; *Farges* sine no.; *Henry* 1438, 3778.

134. *G. Bodinieri* Lévl. in Bull. Géogr. Bot. **24**, 22 (1915).

W. Szechwan.—Iochan and Mount Ormei, on rocks, 3200 m.—*Henry* 7123; *Pratt* sine no.; *Wilson* (Veitch Exped.) 5108a.

Ser. vi. HUMILES *Marquand*, series nova.
Flores parvi, caerulei vel albi.

135. *G. subtilis* H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. **63**, 103 (1926) (Hand.-Mazz. Pl. Nov. Sin., Fortsetz. **40**, 9); et in Hand.-Mazz. Symb. Sin. **7**, 965 (1936).

N.W. Yunnan.—Mekong-Salwin divide, under Rhododendrons, 3700–4150 m.—*Handel-Mazzetti* 9941.

136. *G. Yokusai* Burkill in Journ. Proc. As. Soc. Beng. n.s. **2**, 316 (1906).—*G. rigidifolia* H. Sm. in Hand.-Mazz. Symb. Sin. **7**, 956 (1936).

Szechwan, Kiangsi, Hupeh and Kwangtung.—Widely distributed as a paddy-field weed at low altitudes.—*Bourne* sine no.; *Faber* 295; *Henry* 506, 765, 7377, 8854; *Maingay* 424; *Pratt* 388; *Shearer* sine no.; *H. Smith* 7348; *Wenyon* sine no.; *Wilson* (Veitch Exped.) 74.

137. *G. pallescens* H. Sm. (errore typographico "*G. pallida*") in Hand.-Mazz. Symb. Sin. **7**, 962 (1936).

N.W. Yunnan.—Between Huba and Dugwan-tsun, forming mats on the timber line, 4175 m.—*Handel-Mazzetti* 6884.

According to Dr. Harry Smith (in litt. 3/3/1936) *G. pallida* was a typographic error for *G. pallescens*.

138. *G. microphyta* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 130 (1890); Kusnez. Monogr. 420.

Yunnan.—Tsang-shan, above Tali, in woods, 4000 m.—*Delavay* sine no.; *Forrest* 3834, 7074.

139. *G. napulifera* Franch. in Bull. Soc. Bot. France, **43**, 488 (1896).

Yunnan and Fukien.—On grassy mountains and marshy meadows, 1500 m.—*Delavay* sine no.; *Dunn's collector* 3359; *Forrest* 24329; *Handel-Mazzetti* 6369; *Henry* 12098.

140. *G. aperta* Maxim. in Bull. Acad. Pétersb. **27**, 500 (1881); Mél. Biol. **11**, 264; Kusnez. Monogr. 378.

Kansu.—*Przewalski* sine no.; *Purdom* sine no.

141. *G. Ivanoviczii* Marquand, nom. nov.—*G. Maximowiczii* Kusnez. in Mél. Biol. **13**, 175 (1891 vel 1892); et in Bull. Acad. Pétersb. **34**, 505 (1892); Kusnez. Monogr. 378; non Kanitz (1891).

W. Kansu and W. Szechwan.—Heaths, 3000–3600 m.—*Farrer* 326; *Potanin* sine no.; *Wilson* (Veitch Exped.) 4140.

The specific epithet, referring to Karl Ivanovicz Maximovicz, maintains Kusnezow's intention of honouring the famous Russian botanist.

142. *G. parvula* H. Sm. in Hand.-Mazz. Symb. Sin. **7**, 961 (1936).

Szechwan.—Ningyüen, Lololand, on sandstone, 3275 m.—*Handel-Mazzetti* 1510.

143. *G. leucomelaena* Maxim. in Bull. Acad. Pétersb. **34**, 505 (1892); Kusnez. Monogr. 376.

N. Tibet and Kansu.—Near Old Taochow, 3300–3800 m.—*Ching* 821; *Przewalski* sine no.; *Purdom* sine no.; *Pratt* 503.

144. *G. spathulifolia* Maxim. ex Kusnez. in Bull. Acad. Pétersb. **35**, 351 (1894); Kusnez. Monogr. 386.—*G. aperta* Maxim. in Bull. Acad. Pétersb. **27**, 500 (1881), partim; Mél. Biol. **11**, 264 (1881).

S. Kansu and W. Szechwan.—Sungpan and near Laoshan.—*Farrer* 326; *Licent* 4197; *Potanin* sine no.; *Purdom* sine no.; *Rock* 14606; *Wilson* (Veitch Exped.) 4134.

145. *G. pseudoaquatica* Kusnez. in Act. Hort. Petrop. **13**, 63 (1893); Kusnez. Monogr. 388.

Shansi.—Peitai and Wu-tai-Shan.—*Potanin* sine no.

146. *G. Grumii* Kusnez. in Act. Hort. Petrop. **13**, 63 (1893); Kusnez. Monogr. 388.

W. Kansu and N. Tibet borders.—Nan shan Range.—*Grum-Grshimailo* 93.

147. *G. heleonastes* *H. Sm.* in Kew Bull. 1937, 132.

N.W. Szechwan.—Tsipula, in moist grassy places, about 4000 m.
—*H. Smith* 4192.

148. *G. deltoidea* *H. Sm.* in Hand.-Mazz. Symb. Sin. 7, 966 (1936).

S. Szechwan.—Pizi, on the Muli Range, on schistose soil, 3500 m.
—*Handel-Mazzetti* 7477.

149. *G. Prattii* *Kusnez.* in Act. Hort. Petrop. 13, 63 (1893);
Kusnez. Monogr. 387.

W. Szechwan, W. Kansu and Shensi.—Minchow, Tai-pei-shan
and near Ta-tsien-lu.—*Purdom* sine no.; *Pratt* 563; *Rock* 17465.

150. *G. incompta* *H. Sm.* in Hand.-Mazz. Symb. Sin. 7, 952
(1936).

W. Hupeh and N.E. Szechwan.—Chengko.—*Farges* sine no.
(Herb. Paris); *Wilson* (Veitch Exped.) 2764.

151. *G. Licentii* *H. Sm.* in Kew Bull. 1937, 132.

N.E. Kansu.—Lashing, near Hoan-kia-ho.—*Licent* 5051.

152. *G. praticola* *Franch.* in Bull. Soc. Bot. France, 43, 489
(1896)—*G. congestiflora* *Marquand* ex *Wilkie*, *Gentians*, 151, *nomen.*

Yunnan.—Liang-wang-shan.—*Cavalerie* 3059; *Maire* 885.

153. *G. aphrosperma* *H. Sm.* in Kew Bull. 1937, 133.

N. Szechwan.—Hsioeh-shan, in alpine meadows, 4300 m.—*H. Smith* 3420.

154. *G. radiata* *Marquand* in Kew Bull. 1931, 87.

Szechwan.—Muli district, Mount Siga, north-east of Kulu, in
meadows, 4150 m.—*Rock* 17886.

155. *G. bella* *Franch.* apud *Hemsl.* in Journ. Linn. Soc., Bot.
26, 124 (1890); *Kusnez. Monogr.* 423.

Yunnan.—In pastures, Yentze-hay above Lankong, 3200 m.—
Delavay 2033, 2785.

156. *G. pubicaulis* *H. Sm.* in Hand.-Mazz. Symb. Sin. 7, 970
(1936).

Szechwan.—Sungpan Range.—*Weigold* sine no.

157. *G. Piasezkii* *Maxim.* in Bull. Acad. Pétersb. 26, 498 (1880);
Kusnez. Monogr. 396.

W. Kansu and N.E. Tibet.—*Farrer* 25, 152; *Potanin* sine no.;
Purdom sine no.

158. *G. inconspicua* H. Sm. in Kew Bull. 1937, 131.

N. Szechwan.—Dongrergo, among *Rhododendron* scrub, 4100–4300 m.—*H. Smith* 3338, 3903.

159. *G. flexicaulis* H. Sm. in Kew Bull. 1937, 133.

N.W. Szechwan.—Sankar-vou-mâ and Matang, 3800–4600 m.—*H. Smith* 4343, 4420.

160. *G. albo-marginata* Marquand, nom. nov.—*G. albescens* Franch. ex Kusnez. in Act. Hort. Petrop. **15**, 409 (1904), non Favre (1875). *G. argentea* Royle var. *albescens* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. **26**, 124 (1890).

Yunnan.—Lankong, on hills, and the Chien Chuan valley, on rocky ground, 2700–3000 m.—*Delavay* sine no.; *Forrest* 406, 2172; *Henry* 10903; *Maire* 754.

161. *G. stellulata* H. Sm. in Hand.-Mazz. Symb. Sin. **7**, 968 (1936).

N.W. Yunnan.—Between the Salwin and Mekong, in forest and bamboo brakes, 3600–3950 m.—*Handel-Mazzetti* 8360.

var. *dichotoma* H. Sm. l.c. 968.

N.W. Yunnan.—Gomba-la, 3200–3300 m.—*Handel-Mazzetti* 9533.

162. *G. Forrestii* Marquand in Kew Bull. 1928, 52.

N.W. Yunnan.—Mekong-Salwin divide, on open moist stony pastures, 3600–3900 m.—*Forrest* 14183.

163. *G. myrioclada* Franch. in Bull. Soc. Bot. France, **43**, 487 (1896).

W. Szechwan.—Cheng-kou-ting neighbourhood.—*Farges* 289.

164. *G. Mairei* Lévl. in Bull. Géogr. Bot. **24**, 22 (1915).

Yunnan.—Lochan summit, 3400 m.—*Maire* sine no.

165. *G. vandellioides* Hemsl. in Journ. Linn. Soc., Bot. **26**, 137 (1890); Kusnez. Monogr. 394.

Hupei.—Fang, on rocks at 2000 m.—*Henry* 6738, 6871.

var. *biloba* Franch. in Bull. Soc. Bot. France, **43**, 486 (1896).

Szechwan.—Cheng-kou-ting.—*Farges* 1106, 1243.

166. *G. riparia* Karel. et Kiril. in Bull. Soc. Nat. Mosc. 1841, 706; Kusnez. Monogr. 417.—*G. aquatica* Ledeb. Fl. Ross. **3**, 62 (1847).

Kansu, Shansi and N. Tibet.—*Potanin* sine no.; *Przewalski* sine no.; *Rock* 14021.

167. *G. nanobella* Marquand in Kew Bull. 1928, 53.

N.W. Yunnan.—Mekong-Salwin divide, in open moist pasture, 3900 m.—*Forrest* 13220.

168. *G. pudica* Maxim. in Bull. Acad. Pétersb. **26**, 497 (1880).—*G. prostrata* var. *pudica* Kusnez. in Act. Hort. Petrop. **15**, 370 (1904).

Kansu and N.E. Tibet.—North of the River Tetung, and Ko-ko-nor district, on mountain pastures.—*French Ridley* 23; *Licent* 4895; *Przewalski* sine no.

169. *G. Loureirii* Griseb. in DC. Prodr. **9**, 108 (1885); Kusnez. Monogr. 404.

Kwangtung.—Lo-fou-shan and Pei-yung-shan, on terraces in fields at low altitudes.—*Bodinier* 1024; *Hance* 3879; *Ko* 50116; *Sampson* 167; *Tso* 20033.

170. *G. papillosa* Franch. in Bull. Soc. Bot. France, **31**, 394 (1884); Kusnez. Monogr. 405.

Yunnan.—Tapintze, Tali.—*Bodinier* 29, 2153, 2549; *Delavay* 11; *Schoch* 142.

171. *G. alsinoides* Franch. in Bull. Soc. Bot. France, **31**, 374 (1884); Kusnez. Monogr. 415.

Yunnan.—Yang-in-chan, above Lan-kong.—*Delavay* sine no.; *Rock* 4440; *Schneider* 2009 pro parte.

172. *G. maeulchanensis* Franch. in Bull. Soc. Bot. France, **43**, 488 (1896).

Yunnan.—Tali Range and Ma-eul-chan near Hoking, in stony pastures and woods, 2500–3600 m.—*Delavay* 4882; *Forrest* 3822, 9542, 9726.

173. *G. heterostemon* H. Sm. in Hand.-Mazz. Symb. Sin. **7**, 953 (1936).—*G. pedicellata* var. *chinensis* Kusnez. in Act. Hort. Petrop. **15**, 402 (1904)—*G. Monbeigii* Marquand ex Wilkie, *Gentians*, 160, *nomen*; *G. ramosa* Marquand ex Wilkie, loc. cit. 164.

Yunnan and W. Szechwan.—Ta-pin-tze, Teng, in open pastures.—*Cunningham* 275; *Delavay* sine no. *Ducloux* 314; *Forrest* 9726; *Maire* 594, 1509, 2726; *Monbeig* sine no.; *Wilson* (Veitch Exped.) 4135, 4136.

var. *rosulata* (Kusnez.) Marquand, comb. nov.—*G. pedicellata* var. *rosulata* Kusnez. in Act. Hort. Petrop. **15**, 400 (1904).

Yunnan.—Mengtze, on grassy mountains, 1500 m.—*Henry* 10505.

var. *Chingii* Marquand in Kew Bull. 1931, 85.

Anhwei.—Huang shan, under shade, 630 m.—*Ching* 4157.

174. *G. moniliformis* Marquand in Kew Bull. 1931, 86; et in Journ. Roy. Hort. Soc. **57**, 210 (1932).

Yunnan.—Hills east of Tengyueh, 25° N., in marshy pastures, 2100 m.—*Forrest* 7655.

175. *G. chungtienensis* Marquand in Kew Bull. 1928, 50.
N.W. Yunnan.—Chungtien plateau, 27° 45' N., in moist open pasture.—Forrest 13865.

176. *G. pedata* H. Sm. in Hand.-Mazz. Symb. Sin. 7, 967 (1936).
N.E. Yunnan.—Lou pou, Tong tchouan, 2600 m.—Ducloux 3187, 4307 (type).

177. *G. macrauchena* Marquand in Kew Bull. 1931, 85 (errore typographico "*G. macraucena*").

S.E. Tibet, Tsarong.—Mekong-Salwin divide, Ka-gwr-pu, on boulders and open moist pastures, 3600–3900 m.—Forrest 14196.

178. *G. subuniflora* Marquand in Kew Bull. 1931, 87.

W. China.—Heaths, 4300–4500 m.—Wilson (Veitch Exped.) 4132.

179. *G. Franchetiana* Kusnez. in Act. Hort. Petrop. 15, 385 (1904).—*G. pulla* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. 26, 133 (1890), non Griseb. (1874).

Yunnan.—Lankong, on mountains, 2200 m.—Delavay 2083 bis ; Forrest 22201.

180. *G. exigua* H. Sm. in Hand.-Mazz. Symb. Sin. 7, 957 (1936).

Yunnan.—In the neighbourhood of Lichiang and between Yangzi and Gungschan.—Forrest 22201 ; Handel-Mazzetti 3489 ; Schneider 2009 pro parte.

181. *G. anisostemon* Marquand in Kew Bull. 1931, 88.

Yunnan.—In alpine meadows on the eastern slopes of the Lichiang snow range, 3600 m.—Rock 8339.

182. *G. tatsienensis* Franch. in Bull. Soc. Bot. France, 43, 489 (1896).

E. Tibet, Kiala, and W. Kansu.—Potanin sine no. ; Przewalski sine no. ; Soulié 942.

183. *G. taliensis* Balf f. et Forrest in Notes Roy. Bot. Gard. Edinb. 4, 75 (1907).

Yunnan.—Around Tali, abundant on grassy slopes, 2000–2400 m.—Bodinier 1516 ; Ducloux 296 ; Forrest 702 ; Maire 756 ; Schneider 106.

Species imperfecte cognita.

184. *G. sutchuenensis* Franch. apud Hemsl. in Journ. Linn. Soc., Bot. 26, 136 (1890) ; Kusnez. Monogr. 406.

The type of this species has not been found, and its taxonomic position cannot be determined from the very incomplete original description.

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XXI—CONTRIBUTIONS TO THE GENTIAN FLORA OF SOUTHERN TIBET, N.E. BURMA AND BHUTAN. C. V. B. MARQUAND.

The following Enumeration comprises the gentians of recent collections made by Captain F. Kingdon Ward, and of others made by Messrs. F. Ludlow and G. Sheriff, and by Mr. K. N. Sharma, all

received on loan for study from the Department of Botany, British Museum. It includes also records of specimens sent to Kew by Captain Kingdon Ward from two earlier expeditions to the Burma-Tibet frontier. Five species are described here for the first time.

Sect. **OTOPHORA** *Kusnez.* : supra p. 152.

G. damyonensis *Marquand* in Kew Bull. 1928, 51.

BURMA-TIBET FRONTIER. Flowers pale cream, speckled violet ; forms large carpet-like colonies bearing dozens of erect flowering shoots, on the high alpine rocks and gravelly slopes, 28° 25' N., 97° 55' E., 3900–4200 m., Nov. 23, 1931, *Kingdon Ward* 10099.

G. decorata *Diels* in Notes Roy. Bot. Gard. Edinb. 5, 220 (1912).

S.E. TIBET. Flowers violet ; alpine turf slopes, Zo La, between Shugden and Sangachu Dzong, 4500–4800 m., Sept. 7, 1933, *Kingdon Ward* 10875.

G. infelix *C. B. Clarke* in Hook. f. Fl. Brit. Ind. 4, 111 (1883).

NEPAL. Meechal, 4700 m., Aug. 25, 1932, *Sharma* 377.

G. microtophora *Marquand*, sp. nov. (Sect. *Otophora*) ; in sectione plicis vix auriculatis distinctissima ; facie et habitu *G. infelix* C. B. Clarke a qua calycis lobis subacutis, statu humiliore, floribus multo minoribus differt ; a *G. minuta* N. E. Brown calycis lobis haud recurvatis, corolla duplo majoribus recedit.

Perennial with a rather slender caudex giving rise to a single root, simple or branched at the base. *Stems* one to numerous, decumbent, unbranched, 1–1.5 cm. long, the fertile ones with a single terminal flower. Base of stem bearing several short, triangular, acute hypophylls, united in pairs into conspicuous leaf sheaths. No *basal rosette leaves* present. *Cauline leaves* ovate-lanceolate, subacute, 3 mm. long, 1.5 mm. wide, without a conspicuous hyaline margin. *Flowers* solitary, terminal, shortly pedicellate (pedicels 1–2 mm. long). *Calyx* campanulate : tube 1.5–2 mm. long, 2 mm. in diameter ; lobes 5, equal, ovate, narrowed at the base, subacute, 2 mm. long, 1.25–1.5 mm. wide, sinus acute. *Corolla* tubular-campanulate : tube 4–4.5 mm. long, 2 mm. in diameter ; lobes 5, lanceolate-ovate, subobtusate, 2.5 mm. long, 1.5 mm. wide, veins rather conspicuous in dried specimens ; plicae minute, triangular, scarcely $\frac{1}{4}$ the height of the lobes. *Stamens* five, 4–5 mm. long : anthers subglobose ; filaments filiform. *Ovary* subsessile, 4.5 mm. long, 0.75 mm. in diameter ; style very short. *Mature seeds* not seen.

BURMA-TIBET FRONTIER. Sources of the Irrawaddy, Adung valley, 28° 20' N., 97° 40' E., 4200–4500 m., Aug. 8, 1931, *Kingdon Ward* 9921 (type in Brit. Mus.).

This species is placed in Sect. *Otophora* on account of its obvious affinities with *Gentiana infelix* and *G. tsarongensis* ; the plicae, however, are not typical for the Section *Otophora* but show a

transition to the Section *Chondrophylla*. It is the only aberrant species of the otherwise extremely well marked Section *Otophora*.

Gentiana otophora Franch. var. **ovatisepala** Marquand, var. nov. ; a typo floribus minoribus, calycis lobis ovatis acutis inter se inaequalibus multo majoribus ad 5 mm. longis 2.5 mm. latis basi constrictis, tubo usque ad 6 mm. longo differt.

BURMA-TIBET FRONTIER. Sources of the Irrawaddy, Adung valley, 28° 20' N., 97° 40' E., 3900–4200 m., Sept. 12, 1921, *Kingdon Ward* 9927 (type in Brit. Mus.).

The collector describes this plant as follows: "Flowers pale yellow, speckled violet. Scattered over steep alpine turf and flower-clad slopes. The stems are more or less prostrate and ascending, the flowers standing erect." The calyx-lobes are unequal in size, unlike those of typical *G. otophora*, but they exhibit a considerable range of variation, the largest being sometimes distinctly foliaceous.

G. tsarongensis Balf. f. et Forrest ex Marquand in Kew Bull. 1928, 62.

TIBET. Flowers glossy violet ; growing all over the bare alpine turf slopes and rock outcrops, abundant and commonest alpine autumn flower, 28° 25' N., 97° 55' E., *Kingdon Ward* 10108.

BURMA-TIBET FRONTIER. Flowers violet with yellow anthers, having rather the shape and appearance of a *Crocus* ; forms mats on the smooth glaciated granite rocks in the high Alps, 28° 25' N., 97° 55' E., 4200 m., Nov. 22, 1936, *Kingdon Ward* 10096.

Sect. **DIPTEROSPERMUM** Marquand ; supra p. 155.

G. bomareoides Marquand in Kew Bull. 1931, 73.

BURMA-TIBET FRONTIER. Flowers violet, alternating in bands lighter and darker ; a common twiner in open thickets where *Arundinaria* grows, 28° 25' N., 97° 55' E., 1800 m., Nov. 4, 1931, *Kingdon Ward* 10146.

G. Heleni Marquand in Kew Bull. 1931, 69.

BURMA-TIBET FRONTIER. Flowers almost white, faintly and delicately flushed pinky purple ; open places, thickets facing south, hills east of the Nam Tisang, 28° 20' N., 97° 40' E., 1200 m., Jan. 5, 1931, *Kingdon Ward* 9092 ; without field data, *Kingdon Ward* 10184.

S.E. TIBET. Flowers purple ; a twiner in thickets and damp shady valleys, Rong Tö valley, near Rima, Zayul, 1500 m., Dec. 3, 1933, *Kingdon Ward* 10999.

G. Kingdonii Marquand in Kew Bull. 1931, 70.

S.E. TIBET. Flowers violet, nearly over ; on the edge of mixed forest, Modung, Rong Tö valley, Zayul, 2400–2700 m., Oct. 25, 1933, *Kingdon Ward* 10917. Flowers violet ; a twining plant in the forest, Putsang river, Rong Tö valley, 2400 m., Nov. 2, 1933, *Kingdon Ward* 10948.

Sect. **FRIGIDA** *Kusnez.*; supra p. 157.

G. atuntsiensis *W. W. Sm.* in Notes Roy. Bot. Gard. Edinb. 7, 121 (1913).

S.E. TIBET. Flowers a gorgeous sea blue; an erect glabrous plant, scattered on the dry turf slopes where shrubs (*Rhododendron*, *Salix*, etc.) grow, Shiuden Gomba, Nagong, 4200–4500 m., Aug. 18, 1933, *Kingdon Ward* 10766.

G. filistyla *Balf. f. et Forrest ex Marquand* var. **parviflora** *Marquand*, var. nov.; a typo floribus multo minoribus vix usque ad 1.5 cm. longis differt.

BURMA-TIBET FRONTIER. Flowers trumpet or narrow funnel shaped, more or less erect or prostrate, sessile or nearly so, brilliant ultramarine; it forms small carpeting colonies on the steep alpine turf slopes; just coming into flower, not common (collected in the Seinghku valley in 1926); leaves fleshy, closely imbricated, glabrous; calyx green, glabrous; sources of the Irrawaddy, Adung valley, 28° 20' N., 97° 40' E., 4200 m., *Kingdon Ward* 9865 (type in Brit. Mus.). Fruit of same: "Seeds ripe in the first fortnight of October," 4200 m., Oct. 16, 1931, *Kingdon Ward* 10122. Flowers violet; in clumps on alpine turf and rock slopes, Diphuk La, 4200 m., July 29, 1926, *Kingdon Ward* 7222. Valley of the Seinghku, 28° 10' N., 97° 20' E., 4200 m., Oct. 14, 1926, *Kingdon Ward* (with no. 7592).

This is a particularly interesting plant in that it connects the Himalayan *G. tubiflora* with the Chinese *G. filistyla* through the var. *namlaënsis* *Marquand* of the former species. The flowers are the size of the former, from which the present plant is distinct in the leaves being rounded at the apex, in which character it agrees with the type of *Gentiana filistyla*.

G. gilvo-striata *Marquand* in Kew Bull. 1931, 83.

TIBET. Flowers a lovely blue, fine speckled inside; on an earth slide, amongst tall herbage in the open river bed, Putsang river, Rong Tö valley, Zayul, 3000 m., Nov. 5, 1933, *Kingdon Ward* 10955. Sources of the Irrawaddy, 28° 20' N., 97° 40' E., *Kingdon Ward* 10000.

G. gilvo-striata *Marquand* var. **stricta** *Marquand* var. nov.; a typo calycis lobis ovatis subacutis, foliis angustioribus differt.

Perennial, subprostrate with numerous barren stems and 1–3 fertile stems arising from a rather slender caudex. *Stems* all naked at the base, terminated by a rosette of leaves with a few smaller leaves below. *Leaves* elliptic to spatulate or oblanceolate, subobtusely, margin scaberulous, those on the barren stems up to 9 mm. long, 1.5 mm. wide, those on the fertile stems somewhat larger. *Calyx-tube* tubular, up to 1 cm. long, 5 mm. in diameter at the mouth, coloured dark purple on one side; lobes broadly ovate, up to 3 mm. long, 2 mm. wide, constricted at the base. *Corolla* infundibular;

tube very slightly expanded above the calyx, rich blue; lobes 5, broadly ovate, shortly acuminate; plicae subtruncate, 2–3 mm. wide. *Stamens* united to just above middle of filaments, free portion 1 cm. long; anthers 2 mm. long, ellipsoid, slightly attenuate at the apex. *Ovary* stipitate, linear-lanceolate; style long.

TIBET-BURMA FRONTIER. On alpine grass slopes and cliffs in clumps, flowers rich blue, Delei valley, 28° 15' N., 96° 35' E., 3400–3600 m., Oct. 25, 1928, *Kingdon Ward* 9715 (type in Kew Herb.).

G. Handeliana H. Sm. in Anz. Akad. Wiss. Wien, Math.-Nat. 63, 98 (1926).

BURMA-TIBET FRONTIER. Corolla cream inside, green, speckled dull violet outside; flowers in compact heads; whole plant glabrous; forms clumps in open turfy patches amongst dwarf *Juniperus*, *Rhododendron*, etc., in the Fir forest; sources of the Irrawaddy, Adung valley, 3600 m., *Kingdon Ward* 9970.

G. Handeliana H. Sm. var. *brevisepala* Marquand in Kew Bull. 1931, 84.

UPPER BURMA. Flowers dark blue; on alpine turf slopes in the valley of the Seinghku, near the Tibetan frontier, 28° 90' N., 97° 20' E., 3600 m., Oct. 5, 1936, *Kingdon Ward* 7541.

G. lhakangensis Marquand, sp. nov.; affinis *G. decumbenti* L. et *G. stramineae* Maxim., a priore floribus albis, a posteriore calyce truncato, ab utroque floribus dense aggregatis differt.

Perennial. *Caudex* not seen. *Stems* decumbent, rather thick, terete, glabrous, 20–25 cm. long, with 3–4 pairs of leaves. *Basal leaves* narrowly lanceolate, acute, attenuate into the leaf sheath, 15–22 cm. long, 2–5 cm. wide (fibrous leaf bases not seen); midrib broad, lateral nerves slender. *Cauline leaves* lanceolate or recurved, acute, up to 6 cm. long, 8–9 mm. wide, apex subacute. *Flowers* densely aggregated in a pseudo-capitate terminal inflorescence with a few arising on short peduncles from the nodes below. *Bracts* leaflike but smaller. *Calyx* truncate, dimidiate-spathaceous, membranous, 6–7 mm. long, 4–5 mm. wide, lobes 0 or reduced to minute denticulations. *Corolla* tubular-infundibular, greenish white: tube 2.2–2.6 cm. long, 8–9 mm. in diameter at the mouth; lobes ovate, subacute, 4–5 mm. long, 3–4 mm. wide; plicae triangular, acute, scarcely half the length of the lobes. *Stamens* 5: filaments slender, filiform, not winged, 2 cm. long, upper 1.2 cm. free from the corolla; anthers narrow-oblong, 2 mm. long. *Ovary* shortly stipitate, 1.5 cm. long, 1.5 mm. wide, gradually attenuated into a short bifid style (about 1 mm. long); stigmata recurved. *Mature seed* not seen.

S. TIBET. Lhakang, on open grassy hillside, 3900 m., Sept. 1, 1933, *Ludlow & Sheriff* 515 (type in Brit. Mus.).

G. lhassica Burkill in Journ. As. Soc. Beng. n.s. 2, 311 (1906).

S.E. TIBET. Flower deep cornflower blue; on open grassy hill-

sides, stony soil, Dza La, 4800 m., Aug. 10, 1934, *Ludlow & Sheriff* 788.

G. oreodoxa *H. Sm.* in *Anz. Akad. Wiss. Wien, Math.-Nat.* **63**, 99 (1926).

TIBET. In flower on the steep rocky side of a dry gully, in full sun, 3000–3400 m., Nov. 28, 1933; in fruit on the screes at the base, 3600 m., Rong Tö, Dibang divide, Zayul, *Kingdon Ward* 10860.

G. phyllocalyx *C. B. Clarke* in *Hook. f. Fl. Brit. Ind.* **4**, 116 (1883).

N. BURMA. Flowers blue; on alpine turf slopes facing north, Kaso, Delei valley, 28° 21' N., 96° 37' E., 3600–3900 m., July 2, 1928, *Kingdon Ward* 8410.

BURMA-TIBET FRONTIER. Flowers Prussian blue outside, ultramarine within, anthers and stigmas white; a glabrous plant growing scattered amongst dwarf *Rhododendron*, on precipitous turf slopes; sometimes forms considerable colonies and grows 6 inches high, now in good bloom, pollinated by flies, 3900–4200 m., July 22, 1931, *Kingdon Ward* 9847. Flowers pale blue; forms small clumps on alpine turf slopes; very like 9847 and often associated with it, but an altogether smaller plant with paler coloured flowers; the scape does not lengthen out as it does in 9847 and the anthers are much smaller; sources of the Irrawaddy, Adung valley, 28° 20' N., 97° 40' E., *Kingdon Ward* 9980.

TIBET. In fruit; the flowers are usually solitary, but sometimes an extra one is borne in one of the lower leaf axils; 28° 25' N., 97° 55' E., *Kingdon Ward* 10113.

G. prolata *Balf. f.* in *Trans. Proc. Bot. Soc. Edinb.* **27**, 266 (1918).

N. E. BHUTAN. Open stony ground above the tree line, Me La, 4200 m., Oct. 5, 1934, *Ludlow & Sheriff* 1024.

G. setulifolia *Marquand* in *Kew Bull.* 1928, 56.

BURMA-TIBET FRONTIER. Valley of the Seinghku, on granite slabs in shelter under cliffs, but in the open, 3000 m., *Kingdon Ward* 7485. Valley of the Seinghku, 28° 10' N., 97° 20' E., 3600–3900 m., Oct. 13, 1926, *Kingdon Ward* (with no. 7585).

This extremely interesting species has not been found elsewhere.

G. sikkimensis *C. B. Clarke* in *Hook. f. Fl. Brit. Ind.* **4**, 144 (1883).

TIBET. Flowers pale blue; a glabrous plant growing in small colonies under bushes or on grassy banks, 28° 25' N., 97° 55' E., *Kingdon Ward* 10004. Flowers washy blue; under *Rhododendron* bushes and on grassy alpine slopes, Chutong Camp, Ata Kang La, Zayul, 3900 m., Oct. 20, 1933, *Kingdon Ward* 10910.

G. sino-ornata *Balf. f.* in *Trans. Proc. Bot. Soc. Edinb.* **27**, 253 (1918).

TIBET. 28° 25' N., 97° 55' E., Sept. 19, 1931 (growing with *G. Veitchiorum* var. *caelestis* Marquand), *Kingdon Ward* 10101.

Shiuden Gomba, Nagong, 4200–4500 m., Sept. 3, 1933, forms of this species growing with a form of *G. Veitchiorum* Hemsl., *Kingdon Ward* 10807.

G. sino-ornata Balf. f. var. **punctata** Marquand in Kew Bull. 1931, 84.

BURMA-TIBET FRONTIER. Corolla sea-blue at the mouth, fading through paler blue to almost white at the base, where it is striped and dotted blue; on open patches of gritty loam (granite) between clumps of dwarf *Rhododendron* on sunny slopes in the valley of the Seinghku, 28° 10' N., 97° 20' E., 3600 m., Oct. 13, 1926, *Kingdon Ward* 7586.

G. stictantha Marquand in Kew Bull. 1928, 57.

BURMA-TIBET FRONTIER. Flowers pale yellow, spotted and streaked with violet on the outside; growing in clumps on ledges of grassland escarpments, valley of the Seinghku, 28° 10' N., 97° 20' E., 3600–3900 m., Oct. 4, 1926, *Kingdon Ward* 7530.

G. streptopoda Balf. f. et Forrest ex Marquand in Kew Bull. 1928, 61.

BURMA-TIBET FRONTIER. In colonies on grass slopes and ledges of cliffs, valley of the Seinghku, 28° 10' N., 97° 20' E., 3900 m., Oct. 4, 1926, *Kingdon Ward* 7533. Flowers deep blue (?), closed at the time of collecting, in small close heads; sources of the Irrawaddy, Adung valley, 28° 20' N., 97° 40' E., on steep scrub-clad slopes on the sheltered side of a lofty ridge, 4200 m., Nov. 27, 1931, *Kingdon Ward* 9993. Flowers some shade of blue (closed); on alpine turf slopes, on sheltered flank, 4200 m., Oct. 12, 1931, *Kingdon Ward* 10117.

G. Szechenyi Kanitz, Pl. exped. Szechenyi in As. Centr. coll. 40 (1891).

TIBET. A glabrous plant with mauve flowers; scattered over the dry slopes, Shiuden Gomba, Nagong, 4200–4500 m., Aug. 18, 1933, *Kingdon Ward* 10765. Plants in ripe fruit, shedding their seeds, and other plants in good bloom, growing with *G. sino-ornata*, in ripe fruit, Shinden Gomba, Nagong, 4200 m., Oct. 9, 1933, *Kingdon Ward* 10898.

G. tubiflora Wall. var. **namlaënsis** Marquand in Journ. Linn. Soc., Bot. 48, 206 (1929).

TIBET. Zayul, on steep sheltered alpine slopes with *G. phyllocalyx* and dwarf *Rhododendron*, 4200 m., Oct. 20, 1933, *Kingdon Ward* 10903.

G. Veitchiorum Hemsl. in Gard. Chron. 46, 178 (1909).

TIBET. Damp pastures, 3900–4200 m., July 31, 1933, *Kingdon Ward* 10666. Shiuden Gomba: Nagong, 4200–4500 m., Sept. 3, 1933, a form of this species growing with forms of *G. sino-ornata*, represented under the same number, *Kingdon Ward* 10807. The following notes were made by the collector.—Colour varieties of *G.*

sino-ornata with Cambridge blue, white or violet flowers. White forms are scattered amongst the deep blue; also a few light blue. In damper ground there was a big patch of Cambridge blue only.

var. *caelestis* Marquand in Kew Bull. 1931, 84.

TIBET. 28° 25' N., 97° 55' E., *Kingdon Ward* 10101.

This grew mixed with a form of *G. sino-ornata* Balf. f., both plants being represented under the same number. The following notes apparently cover both. "A beautiful species allied to *G. ornata* or *G. Veitchiorum*. The flowers vary from almost Cambridge blue to Oxford blue, the pleats dark on the outside, pale and spotted inside, the mouth of the trumpet sheer blue. It forms large turfy carpets bearing great numbers of more or less prone flowers which open irrespective of the weather. Grows on alpine rocks and slopes in open turfy pastures and even in boggy places. Very abundant."

G. Wardii W. W. Sm. in Notes Roy. Bot. Gard. Edin. 7, 122 (1913).

TIBET. Flowers pure slaty violet; a tiny alpine forming compact little colonies on the grassy slabs and gravel patches of the iceworn rocks; sources of the Irrawaddy, 28° 20' N., 97° 40' E., 3900–4200 m., *Kingdon Ward* 9998. Flowers deep sea blue; forms mats on sandy and gravelly slopes, by streams near the limit of flowering plants, Zo La between Shugden and Sangachu Dzong, 4500–4800 m., Sept. 7, 1933, *Kingdon Ward* 10826. In ripe fruit, alpine turf, Chutong Camp, below the Ata Kang La, Zayul, 4200 m., Oct. 20, 1933, *Kingdon Ward* 10902.

G. Wardii W. W. Sm. var. *micrantha* Marquand, var. nov.; a typo floribus minoribus, corolla vix 1 cm. longa 5–6 mm. diametro fauce leviter contracta, foliis parvis obovato-spathulatis ad 7 mm. longis 3.5 mm. latis differt.

S. E. TIBET. Sources of the Irrawaddy, Adung valley, 4400–4500 m., 28° 20' N., 97° 40' E., Aug. 20, 1931, *Kingdon Ward* 9979. Also at 28° 25' N., 97° 55' E., 4200 m., Sept. 1, 1931, *Kingdon Ward* 10010 (type in Brit. Mus.); *ibid.*, seeds ripe, Oct. 16, 1931, *Kingdon Ward* 10123.

Captain Kingdon Ward made the following notes on no. 9979 in the field.—Corolla pale blue within and without. Flowers almost sessile, bulb-like, appearing in small groups of 1 to 6 almost straight out of the ground. It grows scattered on the topmost ridges on gravelly or sandy patches amongst the rocks; sometimes in the carpet of dwarf willow associated with several other Gentians, particularly nos. 9865 [*G. filistyla* var. *parviflora*], 9921 [*G. microtophora*] and 9980 [*G. phyllocalyx*].

On no. 10010 Captain Kingdon Ward writes: "Flowers ultramarine fading to white at the base. Forms small carpet colonies bearing a dozen or so flowers like fat buttons."

G. yunnanensis Franch. in Bull. Soc. Bot. France, 31, 376 (1884).

BURMA-TIBET FRONTIER. Flowers pallid blue, rather dull and

slaty ; in open places in the forest, 28° 25' N., 97° 55' E., 3400 m., Nov. 6, 1931, *Kingdon Ward* 10044.

Sect. **APTERA** *Kusnez.* ; supra p. 166.

G. straminea *Maxim.* in Bull. Acad. Pétersb. **27**, 502 (1881).

S. TIBET. Flowers cream, unspckled ; a rosette plant with long radiating ascending stems ; leaves fleshy ; on stony ground, open places, Shiuden Gomba, Nagong, 3900–4200 m., July 28, 1933, *Kingdon Ward* 10658.

G. Waltonii *Burkill* in Journ. As. Soc. Beng. n. s. **2**, 310 (1906).

S. TIBET. Flower lemon yellow, slaty streaks down outside of petals ; among stones, only one seen ; Pomo Tso, 4800 m., Sept. 11, 1933, *Ludlow & Sherriff* 526. Flower deep blue ; rocky hillside, Gyantze, 4200 m., Sept. 15, 1933, *Ludlow & Sherriff* 529.

Sect. **CHONDROPHYLLA** *Bunge* em. *Kusnez.* ; supra p. 168

G. bryoides *Burkill* in Journ. As. Soc. Beng. n.s. **2**, 316 (1906).

S. E. TIBET. Flower bright cornflower blue ; open grassy hillside, Mago, 4200 m., Aug. 3, 1934, *Ludlow & Sherriff* 756.

G. burmensis *Marquand* in Kew Bull. 1928, 49.

S. E. TIBET. Flowers violet with white hairs in the throat ; abundant on sunny alpine slopes, amongst rocks, and on gravel slides, forms clumps [mixed with a species of *Gentianella*] ; 3900–4200 m., 28° 25' N., 97° 55' E., *Kingdon Ward* 10105.

G. capitata *Buch.-Ham. ex G. Don*, Prodr. Fl. Nep. 126 (1825).

ASSAM. Flowers pale blue ; in pine forest, open sunny paths and grassy slopes, abundant, 1500–1800 m., March 1, 1933, *Kingdon Ward* 10301.

G. crassuloides *Bur. et Franch.* in Morot, Journ. de Bot. **5**, 103 (1891).

S. E. TIBET. Flower purple azure ; stony damp ground, Mago, 4500 m., Aug. 5, 1934, *Ludlow & Sherriff* 769.

G. grata *H. Sm.* in Anz. Akad. Wiss. Wien, Math.-Nat. **63**, 103 (1926).

BURMA-TIBET FRONTIER. Flowers nodding, very pale blue with dark violet spots towards the base, mostly over, only one flower ; not abundant, growing on a steep earth slope, 3600–3900 m., Sept. 27, 1926, *Kingdon Ward* 7492.

G. formosa *H. Sm.* in Anz. Akad. Wiss. Wien, Math.-Nat. **63**, 104 (1926).

TIBET. A slender entirely glabrous plant scattered on the open steep turfed slopes at the foot of the granite cliffs ; corolla bluish violet, darker at the base, spotted darker within, the rim fringed ; stamens 5 with purple anthers ; flowers are nodding and remain closed in the rain ; sources of the Irrawaddy, 28° 20' N., 97° 40' E.,

3900–4200 m., July 31, 1931, *Kingdon Ward* 9887. Flowers more violet than no. 9887; scattered over the rock slopes on alpine turf, 3900–4200 m., Sept. 27, 1931, *Kingdon Ward* 9995.

G. leucomelaena Maxim. in Bull. Acad. Pétersb. 34, 505 (1892).

LADAK. Flowers white with sepals pale blue; grassy banks of streams, Shushal, 4300 m., Aug. 4, 1936, *Ludlow* 836.

G. Ludlowi Marquand, sp. nov.; affinis *G. pudicae* Maxim., a qua calycis tubo fere duplo longiore pedicellis brevioribus differt.

Annual. Root slender. *Stem* branched near the base, each branch bearing a single terminal flower. *Branches* up to 6 cm. long, green or purplish-brown, angular, asperous or rugose. *Basal leaves* 0 or few. *Cauline leaves* ovate, acute, 6–7 mm. long, 3–3.5 mm. wide, with a narrow cartilaginous margin. *Pedicels* 1–2 mm. long, glabrous. *Calyx* tubular, up to 2 cm. long, 3–3.5 mm. in diameter; lobes triangular, acute, 3–5 mm. long, 1.5 mm. wide at the base, with a scarious margin, narrow at apex, widening downwards to a rather wide sinus. *Corolla* blue; tube 2 cm. long; lobes lanceolate, subacute, 5 mm. long, 2–2.5 mm. wide, suffused with green on exterior; plicae more or less triangular, erose or indistinctly three-lobed, $\frac{1}{2}$ – $\frac{2}{3}$ the length of the lobes. *Stamens* 1.5 cm. long; filaments narrowly winged above, with a single rather wide wing below, united to the corolla-tube for a distance of 12–14 mm.; anthers 2.5 mm. long. *Ovary* shortly stipitate, linear-ellipsoid, attenuate at the apex; style short; gynophore rather stout. *Immature seeds* not winged. *Mature seed* not seen.

S. TIBET. Shady rocky hillside, Lhakang, 3900 m., Sept. 1, 1933, *Ludlow & Sherriff* 507 (type in Brit. Mus.).

This appears to be a rather distinct species allied to *Gentiana pudica* Maxim., a plant from north-west China and north-east Tibet which was referred to *G. prostrata* Haenke, as a variety, by Kusnezow in his monograph on *Eugentiana*. The specific concept taken by that author in this instance is extremely wide, embracing varieties from North and South America as well as throughout Asia.

G. micantiformis Burkill in Journ. As. Soc. Beng. n.s. 2, 315 (1906).

BHUTAN. Flowers pale blue; grassy hill slopes, Yatung, 3000 m., May 18, 1934, *Ludlow & Sherriff* 13a.

Gentiana muscicola Marquand, sp. nov.; affinis *G. vandellioides* Hemsl., a qua corollae plicis laciniatis, calycis lobis triangularibus, sinubus angustioribus, pedicellis multo brevioribus insigniter differt.

Perennial? *Stems* slender, simple or once or twice branched, up to 5 cm. long, glabrous, with slender roots growing in moss. *Basal rosette leaves* none. *Cauline leaves* widespreading, membranous, broadly ovate, apiculate, 4 mm. long, 3 mm. wide, midrib rather conspicuous in the dried state; petioles very short.

Flowers solitary, terminal on the branches; pedicels erect, 3 mm. long. *Calyx* tubular: tube 2-2.5 mm. long, 1.25 mm. in diameter; lobes 5, triangular, acute, erect or slightly spreading at the apex. *Corolla* infundibular, pale violet: tube 5 mm. long; lobes 5, wide-spreading, ovate-lanceolate or narrowly ovate, subacute, 3 mm. long, 1.25 mm. wide; plicae triangular-ovate, lacinate, much shorter than the lobes, whitish. *Stamens* 5: filaments slender, upper 2.5 mm. free; anthers narrow, oblong, 0.75 mm. long. *Ovary* shortly stipitate, ellipsoid, 3 mm. long, 1.25 mm. wide, rapidly attenuate into the long style; style 2 mm. in length; stigmata recurved.

BURMA-TIBET FRONTIER. Flowers faintly violet, shutting up immediately they are extracted from the moss beds in which they grow in the *Tsuga-Rhododendron* forest; Delei valley, 28° 21' N., 96° 37' E., 2700-3000 m., July 6, 1928, *Kingdon Ward* 8393.

This rather distinct species is remarkable in its habit of growth, the stems struggling through the moss.

G. pedicellata Griseb. Gen. et Sp. Gentian. 273 (1839).

NEPAL. Flowers blue, with seeds; Siroo, 2600 m., April 28, 1933, *Sharma* E 518.

G. simulatrix Marquand, sp. nov.; peraffinis *G. tatsienensis* Franch., a qua habitu, caulibus ramosis, floribus fere duplo minoribus differt.

Annual, with a single rather short root. *Stems* numerous, branched, glabrous, up to 3.5 cm. long, arising direct from a rosette of leaves. *Rosette leaves* ovate, 6 mm. long, 4 mm. wide, with thickened margin, apex cuspidate. *Cauline leaves* resembling the rosette leaves but smaller and narrower, 4-5 mm. long, 1.5-2 mm. wide, acute. *Flowers* sessile or subsessile. *Calyx* campanulate; tube 3 mm. long, 3 mm. in diameter; lobes lanceolate, apiculate, with thickened margins, 2 mm. long, 1.25 mm. wide, sinus truncate. *Corolla* cylindrical, pale blue; tube 4-5 mm. long, 2.5 mm. in diameter; lobes ovate, acute, 2.5-3 mm. long, 1.5 mm. wide, blue suffused with green on the interior; plicae variable in shape within the same corolla, deltoid-subovate, acute or unequally bifid, much shorter than the lobes. *Ovary* subsessile. *Capsule* elliptic-oblong, strongly compressed and winged at apex, ultimately exerted on a stipe up to 7 mm. long. *Seeds* subangular, \pm rhomboidal, minutely rugulose, 0.5-0.6 mm. long, 0.3 mm. in diameter.

S. TIBET. Abundant on grassy hill slopes, 3000 m., May 18 (1933), *Ludlow & Sherriff* 12 (type in Brit. Mus.).

Very closely allied to *G. tatsienensis* Franch., a species with flowers nearly twice the size of the present one and with unbranched stems. In both species, as indeed with several in this Section, there is a striking range of variation in the form of the plicae, in some cases even within the same corolla.

G. sororcula Burkill in Journ. As. Soc. Beng. n.s. 2, 315 (1906).

TIBET. Flowers bright blue; on open pine clad slopes, abundant,

Modung, Rong Tö valley, Zayul, 2100–2700 m., May 27, 1933, *Kingdon Ward* (with no. 10433).

G. Yokusai *Burkill* in Journ. As. Soc. Beng. n.s. 2, 316 (1906), forma.

TIBET. Flowers deep blue; on alpine turf slopes, Shiuden Gomba, Nagong, 3900–4200 m., Sept. 1, 1933, *Kingdon Ward* 10802.

XXII—MISCELLANEOUS NOTES.

Notes on *Lilium ochraceum* Franchet and *L. nepalense* Don.—(1) TYPE SPECIMEN OF *LILIUM OCHRACEUM*. In connection with the preparation of the description of *L. ochraceum* Franchet for part 5 of the Supplement to Elwes's "Monograph of the Genus *Lilium*," it has been necessary to consult Franchet's original material. Through the kindness of Monsieur le Prof. Dr. H. Humbert, Directeur, Muséum national d'histoire naturelle, Paris, all the specimens in question have been sent to Kew on loan. As the precise nature of these specimens has never been recorded it appears to be worth while to publish the details.

Franchet's description is based on three gatherings, as mentioned in his well-known paper "Les Lis de la Chine et du Thibet" (Journ. de Bot. 6, 1892). The gatherings are cited in the following sequence, but the data transcribed below are taken from the labels on the herbarium sheets, since they are somewhat fuller than those published.

Lilium ochraceum. [Small label added]

"*Lilium* (Martagon). Fl. jaunâtres. Lieux frais au pied du Tsong chou à 3000 m. d'alt. le 20 Août 1887. legi ipse. J. M. Delavay"
[Field label]

Lilium ochraceum Franch

"No. 369 Vois des montagnes au-dessus de Tapintze, 1 Sept. 1882"
Plantes de Chine (Yun-nan) M. l'Abbé Delavay 1883–1885. [Printed label]

"No. 3274 Fl. jaunâtres; a la fin turbinée. Les broussailles, sur le Hee chan men à 2800 m. d'alt. legi ipse. le 29 Juillet 1888, J.M.D."
[Field label]

There is no doubt that all three gatherings represent *L. ochraceum*. The original description is brief but correct. The leaves are small, up to 5 cm. long and 8 mm. wide. As they are, however, from three different localities, and were collected in three different years, and apparently represent slightly different colour forms, it is advisable to select one as the nomenclatural type (lectotype).

The first gathering cited by Franchet consists of a good specimen with two flowers (one a freshly-opened bud) and dark in colour. It is probably the form very finely speckled with cerise which has since been collected by Forrest and others. The second gathering cited is also a good specimen and has now but a single flower. The flower is pale yellow with the purple coloration in the throat which is characteristic of the usual form of the species. The third

gathering consists of a poor specimen possessing a single flower, now dissected, which was apparently rather dark and very small. This gathering may be disregarded.

Although the specimens were cited by Franchet, none of the sheets was labelled by him. Dr. Humbert informs me that the small label added to the first specimen is in the hand-writing of M. Paul Danguy. The second specimen has a herbarium label with the words of the last line printed; the name, locality and date are added in ink in an unknown hand.

L. ochraceum is a very common species in Western Yunnan and Upper Burma. It occurs in varying shades of yellow and normally has a variable amount of purple colouring in the throat. Forms occur which are finely speckled with maroon or with purple, but these are relatively scarce. The original description states that the flowers are "lutei immaculati."

As the first gathering would appear to be a dark form and as the second specimen, No. 369, shows the yellow flowers with purple throat which exactly resemble the small forms of *L. ochraceum* as understood to-day, it should clearly be chosen as the lectotype of the species.

The localities in question are well known collecting grounds of Delavay. Mr. T. Tang of the Fan Memorial Institute informs me that Tsong-chou is a district near Tsang-shan, a famous summit on the Tali range, which lies to the west of Tali lake (Er Hai); and that Tapintze is another locality on that range and further to the north. The two most important gatherings of the original material were therefore collected on the Tali range.

(2) *L. OCHRACEUM* VAR. *BURMANICUM* (W. W. SM.) COMB. NOV. In the same number of the Supplement the status of *L. nepalense* var. *burmanicum* W. W. Sm. is discussed. E. H. Wilson reduced this plant to a synonym of *L. ochraceum*. With the advent of living plants of *L. nepalense* it has been possible to define the Nepal plant more accurately, and it can now be stated that var. *burmanicum* is not a variety of this species but is, as Wilson believed, connected with *L. ochraceum*. It is however so different from the original form of that plant as collected by Delavay in Yunnan that it is best maintained as a separate variety. The name *L. ochraceum* var. *burmanicum* comb. nov., is therefore proposed.

(3) *L. NEPALENSE* VAR. *CONCOLOR*, VAR. NOV. It has long been known that *L. ochraceum*, which has normally more or less purple coloration in the throat, possessed a pure yellow form which was originally described by Baker as *L. primulinum*. This was referred to *L. ochraceum* by E. H. Wilson and named var. *primulinum*. An examination of Baker's type specimen shows that Wilson was correct. Some writers, however, have regarded Baker's plant as a colour form of *L. nepalense* and consequently considerable confusion exists as to its true position. The difficulty has been solved by the discovery that the true *L. nepalense* also possesses a self coloured

yellow form. Intermediates between the normal and the self coloured form are to be found, but as both species and both varieties are in cultivation, in the interests of uniformity, a varietal name for the newly recognized plant is advisable. The full account of the two lilies and their colour forms will appear in part 5 of the Supplement but for various reasons early publication is desirable and the diagnosis of the new variety is therefore appended.

L. nepalense var. **concolor**. A forma typica floribus non purpureo-coloratis differt. Type in herbarium Royal Botanic Garden, Edinburgh; specimen cultivated in Rock House, 1930, from bulb forwarded from Bhutan by Col. F. M. Bailey. A. D. COTTON.

A New Hybrid Eucryphia.—The hybrid between *Eucryphia glutinosa* (Poepp. et Endl.) Baill. and *Eucryphia lucida* (Labill.) Baill. was raised at Rostrevor, Co. Down, Ireland, in the gardens of the late Sir John Ross of Bladensburg, and was mentioned for the first time in *The Gardeners' Chronicle* **100**, 187 (5th September 1936), as *Eucryphia* "Rostrevor" Hort. Since the short note was in English and appeared after the publication (in January 1935) of Art. 38 of the International Rules as amended at the Fifth International Botanical Congress at Cambridge in 1930, it seems desirable to give a full Latin description of this hybrid, and to provide a scientific name which is in accordance with the rules and which at the same time indicates more or less the character of the hybrid.

The Latin description has not been taken from the original hybrid plant, but from one of its descendants (a cutting), cultivated in the Royal Botanic Gardens, Kew.

× **Eucryphia intermedia** Bausch (*E. glutinosa* (Poepp. et Endl.) Baill. × *lucida* (Labill.) Baill.) hybr. nov. [Eucryphiaceae]; inter parentes optime intermedia, ad *E. glutinosam* ob folia nonnulla praesertim vetustiora pinnata 2-5-foliolata plerumque 3-foliolata foliolis saepe praesertim dimidio superiore dentatis, ad *E. lucidam* ob folia subtus glaucescentia, nonnulla praesertim juniora parva simplicia plerumque integra oblonga brevipetiolata approximans.—*E.* "Rostrevor" Hort., Gard. Chron. **100**, 187 (1936), descr. angl.

Arbor parva semisempervirens, altitudine adhuc incerta; ramuli statu vivo subteretes, subcompressi, sub pressione costato-angulati, brunnei hic illic pruinosi, inferne glabri, superne pilis subadpressis pubescentes. *Stipulae* ovatae, acutae, glabrae, brunneae, 5-7 mm. longae, 3.5-4.5 mm. latae. *Folia* omnia subtus glaucescentia, marginibus debiliter pilosis, ceterum glabra vel juventute supra pubescentia, venatione ut in *E. glutinosa* obvia; saepe summa et juniora per paria ut in *E. lucida* parva, simplicia, oblonga, apice rotundata saepius brevissime emarginata et bidentulata rarius integra, obtusa vel acuta, basi cuneata et in petiolum pubescentem 3-5 mm. longum attenuata, nonnunquam rotundata, 1.4-5.85 cm. longa, 0.5-2.4 cm. lata, saepius integra, rarius dimidio superiore vel

apicem versus dentata; nonnunquam in eodem pari cum altero folio pinnato alterum simplex ceteris simplicibus simile vel rarius basi cordatum invenitur; folia pinnata petiolo 0.4-1.1 cm. longo pubescente; foliola lateralia subsessilia, elliptico-oblonga, apice plerumque obtusa rarius acuta semper breviter apiculata, basi rotundata vel subtruncata aliquantum obliqua, 1.2-3.8 cm. longa, 0.5-1.7 cm. lata, minora integra, majora subintegra vel dimidio superiore argute serrata; foliolium terminale petiolulo 2-5 mm. longo pubescente, vel in foliis 2- vel 4-foliolatis subsessile basi valde obliquum, ellipticum, elliptico-oblongum, oblongum vel oblongo-lanceolatum, apice plerumque obtusum breviter apiculatum vel emarginatulum, basi acutum cuneatum usque rotundatum, 2.2-6.3 cm. longum, lateralibus semper 1.5-2-plo longius, 0.6-3 cm. latum, integrum vel dimidio superiore vel saepe tantum apicem versus ut in *E. glutinosa* serratum. *Inflorescentia* a me nondum visa; flores teste hortulano quodam albi, eis *E. lucidae* paulo majores.

Cult. in Hort. Bot. Reg. Kew., Jan. 1937, *J. Bausch* (typus exempli sicci in Herb. Kew.); descr. et ex arbore viva et ex exemplo sicco confecta.

J. BAUSCH (HOLLAND).

The Birds of Tropical West Africa, Vol. IV.*—The present volume contains the account of the first eight families included in the vast order *Passeriformes*, the so-called "Perching Birds"; these are the *Eurylaemidae* (broadbills), *Pittidae* (pittas), *Alaudidae* (larks), *Motacillidae* (wagtails and pipits), *Timahidae* (babblers), *Pycnonotidae* (bulbuls), *Muscicapidae* (flycatchers), and *Turdidae* (thrushes). Characters by which certain families are differentiated from one another are found to overlap in a most disconcerting way. It is therefore not surprising that although ornithologists have long been familiar with the birds of the genus *Smithornis*, it was not until 1914 that it was first suspected (by Mr. G. L. Bates, a set of whose Cameroons plants is preserved in the Kew Herbarium), that this African genus belonged to the *Eurylaemidae*. This suspicion was confirmed in 1924 by the anatomical investigations of Dr. P. R. Lowe.

The volume begins with a table of classification of the *Passeriformes*, and an illustrated key to the West African families and genera. It is accompanied by a detailed map of the Gambia, in which the boundaries and roads are revised up to 1931. The plan of the work is described in previous notices (*K.B.* 1930, 334; 1932, 416; 1933, 142).

To the general reader the accounts of the habits of the various species, subspecies and races will probably form the most interesting part of the book. These include observations made in other parts of Africa. "The myth that the nightingale never sings in tropical Africa during its winter sojourn in that country seems now to be

* By D. A. Bannerman. The Crown Agents for the Colonies, 4 Millbank, Westminster, 1936. Pp. xl.+459, full page coloured plates 14, text figs. 117, one map. Price 22s. 6d.

successfully disproved. Mr. Holman probably sums the matter up correctly when he states that the full-throated song to be heard in England on summer nights is never heard in the same degree in Africa, but that it does employ many of its beautiful notes can no longer be denied."

The food of the Upper Guinea little green bulbul (*Andropadus virens griseus*) consists wholly of berries of many different kinds, the fruits of two exotic weeds, *Clidemia hirta* and *Lantana*, which both grow on the forest edge at Amani, being much sought after. Stomachs of the yellow-vented bulbul (*Pycnonotus tricolor tricolor*) examined in Tanganyika "contained many different berries, among them *Lantana*, of which this species must be reckoned an active disseminator." Sjöstedt's white-tailed greenbul was often found by Bates in the primeval forests of the Ja river, Cameroons, but still oftener in the second-growth forest consisting principally of Aseng trees (*Musanga Smithii*) on the fruit of which this greenbul feeds. The food of Dunn's lark (*Eremolauda dunni*) in the neighbourhood of Timbuktu consisted of seeds, largely of *Panicum turgidum*. The Palestine short-toed lark (*Calandrella brachydactyla hermonensis*), newly arrived in the French Sudan from the north of the desert, "found the sandy ridges of Taberréshat a good place to stop. They spent the time under the tussocks of *Panicum turgidum* that grew along the sides of these ridges, getting not only shelter from the hot sun under these tussocks, but also food from the seeds they shed."

Among other plants mentioned are the "heskanit" grass [*Cenchrus biflorus* and *C. ciliaris*] and the feathery prairie-grass (*Aristida papposa*) with which the Kordofan or golden bush-lark (*Mirafra cordofanica*) is often associated. The fields of acha grass (*Digitaria exilis*), grown in the north-east corner of Benue Province and the south-west corner of the Plateau Province of Nigeria, attract quantities of tree pipits (*Anthus trivialis trivialis*). Buchanan's bush-skulker (*Argya fulva buechanani*) subsists entirely on insects, mostly beetles or grasshoppers, where these are procurable. When insects are scarce, however, it lives as well on the berries of *Salvadora*. At Tabarréshat Well in the western Sahara, several small parties were observed wherever *Acacia tortilis* grew in any number.

One of the most curious birds described and figured is Kemp's bush-creeper (*Macrosphenus kempi*), which possesses a neck which it can stretch out at will, and when agitated puffs out the long silky feathers of its back and those of the flanks and breast. The most beautiful is undoubtedly the blue fairy flycatcher (plate 9, p. 287), which inhabits all the British West African colonies. Its plumage is light silvery blue (almost grey blue at certain seasons), becoming whitish on the belly. The male bird constantly spreads wide his fan-shaped tail, and when displaying to the female flaps his wings in an agitated manner.

Examples of discontinuous geographical distribution, for which botanical parallels exist, are those of the grey-chested akalat

(*Illadopsis poliothorax*) and the Ruwenzori hill babbler (*Pseudoalcippe atriceps*). The former has been found on Fernando Po at an altitude of 6000 ft., on the Cameroon Mountain, and far away on Ruwenzori, at 7000–8000 ft. Nowhere in the great stretch of intervening forest country has it been found to occur. "This curious distribution is not confined to the species under review; there are a number of other forms peculiar to both mountains." The latter species occurs in the Bansa and Genderu Mountains in British Mandate Cameroons, at altitudes of 4000–6000 ft., on Ruwenzori from 6500 to 9000 ft., and also in the Kivu and Ruanda districts of Uganda.

The volume under review maintains the high standard of its predecessors, and reflects credit on all concerned in its production. The author estimates that two further volumes will be required to complete the work.

Glamorgan Trees and Shrubs.*—The county of Glamorgan is a region which has received in the past but scant attention from chroniclers of the rare and exceptional plants growing in Great Britain. That this lack of interest in the county's treasures is far from justified is shown by the lengthy list of hardy trees and shrubs compiled by Mr. Hyde. The coastal plain of Glamorgan is a fertile region with a mild climate so well suited to the growth of trees and shrubs that only trees of a notable size and shrubs of special horticultural merit could be included in the list.

A short introduction draws attention to some of the outstanding plants, among them an Aleppo pine, *Pinus halepensis* Mill., the largest British example, 73 feet high; the unique orangery at Margam; the European silver fir, *Abies alba* Mill., 145 feet high, at Aberpergwm; and the pencil cedar, *Juniperus virginiana* L., 82 feet high, at Cefn Mably. Many others of equal interest are to be found in the list. In certain cases, information of special interest follows the enumeration of localities and size data. Thus we are told that *Ginkgo biloba* L. is planted as a street tree in Roath, Cardiff. The list is singularly free from errors and misprints, but on p. 228 the initial "Q" is omitted from *Quercus*, and *Q. rubra* L. is given when *Q. rubra* Du Roi evidently is intended, though *Q. borealis* Michx. should be used. The list is illustrated by excellent photographs of some of the individual trees and shrubs mentioned.

R. MELVILLE.

* "Trees and Shrubs" By H. A. Hyde, M.A., F.L.S. Glamorgan County History, vol. I—Natural History, William Lewis, Cardiff. 1936. Pp. 217–231.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1937 ROYAL BOTANIC GARDENS, KEW

XXIII—A CONTRIBUTION TO THE BOTANY OF ATHOS PENINSULA. W. B. TURRILL.

PREFACE.

The Mount Athos Peninsula in the spring, as I have described elsewhere,* is a unique botanical paradise in an almost primitive condition, thanks to the lack of grazing animals.

Judas trees in full flower amongst the grey-green Olives; the Chermes Oak, its young foliage forming brilliant patches of scarlet or golden-bronze; here and there the pale apple-green of the leaves of the Manna Ash, crowned with panicles of white flowers, together with bushes of golden-yellow *Calycotome* made a picture the like of which, I fancy, can be seen nowhere else.

To be a Botanist on the Holy Mountain was not regarded by the Monks as an unusual occupation, for at Karyes there is an official Botanist Monk, who occupies his time in searching for plants of real or supposed medicinal importance. He quickly discovered us and came to call at Pyrgos soon after our arrival—possibly to see that we were not trespassing on his preserves. When he saw the sort of things we were collecting, I fancy his estimation of us was very much lowered and he regarded us as quite harmless.

He was a remarkable old Monk with an extensive knowledge of plants and their properties. Though fully gowned in a long black cassock he travelled very quickly, usually on foot and sometimes on a mule, carrying his "Flora" with him in a large, black, bulky bag. Such a bag was necessary since his "Flora" was nothing less than four manuscript folio volumes of Dioscorides, which apparently he himself had copied out. This Flora he invariably used for determining any plant which he could not name at sight, and he could find his way in his books and identify his plants—to his own satisfaction—with remarkable rapidity.

Sibthorp, it will be remembered, made his important journeys to the nearer East and to Athos with the object of identifying the plants recorded by Dioscorides.

When we met the Herbalist Monk at Pyrgos and later at Chilandari, he was busy collecting *Hyoscyamus* and Liquorice—a piece of the root of the latter he insisted on our chewing, an experience not to be repeated. Monks in other monasteries were also interested in plants, as for instance the "Druggist" Monk in the delightful little

* "A Botanist on the Holy Mountain." Blackwood's Magazine, 1934: (i) July, p. 81; (ii) November, p. 649.

pharmacy at Xenophontos with its array of antique earthenware drug pots, or the Monk at Iviron who gave us a bright-yellow, refreshing "tisane," an infusion of the leaves of *Salvia triloba* which he was cultivating in his garden.

A few plants were noted as being worthy of introduction to English gardens, more especially *Malcomia flexuosa*, *Matthiola sinuata* var. *glandulosa*, with very sweet-scented lilac flowers and grey foliage. *Viola alba* var. *violacea*, and *V. atois*, *Linum elegans*, *Myosotis cadmea* with flowers as fine as those of *Eritrichium*, and *Verbascum bannaticum*. The *Verbascum* and the *Matthiola* have been grown successfully both at Kew and in the south and south-west of England, thanks to the sending of seed by Mr. Loch, and have also ripened seed over here. The Mullein with its 6-8-feet high candelabras of pale yellow flowers is of further interest since the plant is used for stupefying fish. The stems and leaves are boiled in water to extract the juices, and stones attached to ropes are then placed in the boiling liquid and taken to the fishing grounds and placed in the water. After some two hours the fish rise and are easily caught. When we first heard of this plant under the name Flomas (φλόμος) we were rather puzzled as to its identity, but on turning up Dioscorides we found he applies this name to Mulleins in general.

Among other plants of interest we noticed may be mentioned *Lilium candidum*, apparently quite free from disease, while the single Stocks on the monastery walls on the east side of the Peninsula in their many different colours made an unforgettable picture against the grey walls and rocks, only excelled by the beauty of Wistarias in full flower trailing along the balconies of the monasteries.

ARTHUR W. HILL.

INTRODUCTION.

The present paper is based mainly on the collection of plants made during a stay in Athos Peninsula in April 1934. I shall always remain deeply indebted to the Director for making arrangements for me to accompany him to this unique area, and to him and my Herbarium colleague, N. Y. Sandwith, for the great share they took in helping to make the valuable collection which is now incorporated in the Herbarium at Kew. Our thanks are due to Mr. H. G. Chick, C.I.E., C.B.E., formerly Consul-General at Salonika, for assistance in the arrangements to reach and stay on Athos Peninsula and for a considerable number of botanical specimens; to Mr. and Mrs. Sidney Loch for their great kindness and hospitality to us during the time we made our headquarters at Pyrgos; to Mr. Loch for accompanying us on our tours through the Holy Mountain; to Mrs. Loch for botanical specimens and seeds for cultivation collected by her later in the season; and to Mr. H. G. Tedd of Xanthi, for valuable collections from Athos Peninsula and Athos Peak, made in the summer and early autumn of 1934.

The plants considered in this paper include the collection made by us in April 1934 on Athos Peninsula and the Mulyani Islands, excepting the rather large number of Bryophyta, which are reserved for separate treatment, and plants from Athos Peninsula received from Mr. Chick, Mrs. Loch, and Mr. Tedd during 1934. In addition a number of plants collected by us in the neighbourhood of Salonika and on the Chalkidike Peninsula are included, together with some collected by Chick and Tedd on the Longos (Sithonia) Peninsula.

It was thought advisable to give some account of the physiography and geology of Athos Peninsula, to discuss the vegetation and the geographical distribution of the species, and to outline the history of previous botanical exploration of the area. The figures obtained by the analysis and summation of the geographical distributions of the species include only plants from Athos Peninsula, south-east of Xerxes Canal, and enumerated in the list.

We thank the following for help in the identification of special groups: F. Ballard, B. L. Burt, C. E. Hubbard, H. W. Pugsley, and V. S. Summerhayes.

PHYSIOGRAPHY.

The peninsula of Chalkidike is shaped something like the back of a three-fingered hand stretching out into the Aegean Sea. The wrist is the northern depression, containing Lakes Beshik and Langaza, cutting it off from the mainland of Macedonia. The knuckles are the mountain ranges which cross the main body of the peninsula from E. to W. The three fingers are, from west to east, the promontories of Cassandra, Longos, and Athos(1)*. This modified quotation accurately describes the appearance and relative position of Athos Peninsula as seen on a map. The geographical relationships are fundamental in any consideration of botanical history and the following data are particularly important.

The Aegean Sea is approximately 600 km. long, due north and south from the southern coast of Thrace to the northern coast of Crete, and 300 km. broad at the latitude of the southern point of Athos Peninsula ($40^{\circ} 6' N.$), due east and west from the western coast of the Gallipoli Peninsula to the coast of Thessaly. It is an island-filled sea of geologically recent origin in its present form. Distances from the nearest point of the southern part of Athos Peninsula to the following islands and areas of the mainland indicate its fairly central position in the northern part of the Aegean; from Thasos 50 km., from Lemnos 60 km., from Samothrace 100 km., from Imbros 110 km., from Thessaly 130 km., from the Gallipoli Peninsula 160 km. The length of Athos Peninsula, from Xerxes Canal to the extreme south-eastern point along the main ridge, but not allowing for slopes, is 50 km. (nearly 30 miles). Its breadth varies from 2.3 to 8.8 km., excluding the extension of Cape Platy.

For the purposes of this paper Athos Peninsula is considered as commencing at the Xerxes Canal, thus including a north-western

* For literature see p. 203.

extension beyond the low and much broken wall which marks the land boundary of the Holy Territory or Holy Mountain (Hagion Oros). The area between the canal and the wall is now occupied by Greek refugees, or utilized by them for grazing, wood-cutting, etc., from Turkey (Constantinople and Caesarea) and inhabiting the village of Pyrgos. The inclusion of this area is justified by the very natural and well marked boundary which the Xerxes Canal makes, both topographically and geologically, and for the sake of comparisons which can be drawn between areas whose natural vegetation is in process of destruction and those whose primitive plant covering remains untouched or little modified by man and his flocks and herds. An account of the isthmus and of the canal has been published by Spratt (14).

The lowest part of Athos Peninsula is at its north-western end by the Xerxes Canal, where the greatest height is said to be only about 40 m. above sea level (2). From this low altitude there is a gradual rise to the main ridge which runs the length of the Peninsula, and reaches heights of 490 m., 520 m., 670 m., 765 m., and 991 m., before culminating in the steep-sided peak of Mt. Athos with an altitude of 1935 m. The ridge does not rise absolutely regularly but the peaks whose heights have just been given are separated by valleys or plateaus, or small intramontane basins. A considerable number of small, for the most part very small, streams drain to the sea from both sides of the ridge. These may be raging torrents after heavy rain or snow-melting, but for the greater part of the year their beds have little or no flowing water. Nevertheless Athos Peninsula is well-watered by numerous perennial springs, and the water-supply is naturally conserved by the forest covering. The hard, largely impenetrable and little jointed rocks do not cause water to drain away to great depths as in limestone areas of similar latitudes, and there is little or no trace of karst formation. Drought, even seasonal summer drought, is a factor of only local or temporary importance to the climax vegetation.

GEOLOGY.

The Aegean Sea is geologically of very recent formation (3, ch. II). Suess says man may have witnessed its formation, and Walther (4), referring to Seidlitz (5), says "die inselreiche Ägäis hat sich im Diluvium eingesenkt oder durch Ansteigen des Meeresspiegels angegliedert." This youthfulness of the present configuration of the coastal outlines of the northern parts of the Aegean Sea is in striking contrast to the age of the continental blocks to the north and east. The Rodope Massif and parts of western Asia Minor have not been submerged by any of the transgressions of the sea in Tertiary times; they have in fact been land areas, even if possessing extensive freshwater lakes, throughout the geological periods which it is necessary to consider in attempting to trace the history of the phanerogamic flora of the Balkan Peninsula. Athos Peninsula is

geologically a continuation of the Rodope Massif owing its survival to faulting on both sides, and cut off from the main mass of old rocks, extending northwards through the eastern and central parts of the Chalkidike Peninsula, by the relatively shallow Tertiary deposits in the neighbourhood of the Xerxes Canal, and on which Erissos (the ancient Acanthus) is built. These deposits have been variously described as of Sarmatic (Upper Miocene) or Pontic (Lower Pliocene) age and similar deposits separate the gneissic mass of Longos (Sithonia) from the mainland and occupy a much more extensive area in the western parts of Chalkidike, up to the neighbourhood of Salonika. They lie unconformably on the old rocks. The Sarmatic and Pontic waters were much more extensive and important far to the north of our area in which they probably represented inland brackish or freshwater lakes, or arms of such, or more rarely of sea. There is still considerable divergence of geological opinion on the history of the northern Aegean. Cvijić (11) postulates a very extensive Aegean Lake in Pontic times. According to his map, this covered the whole of Chalkidike, except Hortiach and a portion of the centre, and also Kassandra, Longos, and the whole of the Athos Peninsula except the Peak. The evidence, as set out by Cvijić, seems to the writer quite insufficient to support the hypothesis of the late Tertiary occurrence of such a large continuous sheet of water over the North Aegean and its neighbouring lands. We saw no evidence for it on Athos Peninsula apart from the very limited deposits near the Xerxes Canal. Philippson (13, pp. 82-91) has also very adversely criticized Cvijić's data and conclusions and shows that his Aegean lake terraces, if indeed they be such, are probably of more isolated local occurrence than stated by Cvijić, occur at different altitudes, are not always horizontal, and are often at much lower altitudes than those given by Cvijić. That lakes were much more numerous and much larger in Pontic times in Macedonia and neighbouring territories must be admitted, that there was an extensive continuous lake, of inland sea size, is extremely doubtful.

Research more recently published than Cvijić's records the occurrence of marine Sarmatic beds at the Gulf of Orfano (12). These, however, are apparently of limited extension westwards and even if they represent a considerable enlargement of the area known to have been covered by Sarmatic salt waters in the Aegean area, probably represent a temporary break into the land of the Aegean continent, and, with our present knowledge, scarcely justify Wurm's statement: "durch den Nachweis so junger neogener Meeresablagerungen wird der grosse ägäische Kontinente Neumayers wenigstens in seiner nördlichen Ausdehnung erheblich eingeschränkt."

Athos Peninsula south-east of Xerxes Canal is tectonically a great weathered down anticline, with its centre near Karyes (6). There occur more or less alternating outcrops, varying in width, of chlorite-schists, gneiss, mica-schists, and marble. The strike of the beds is approximately transverse to the long axis of the Peninsula,

and they dip away on both sides, to the N.W. and S.E. respectively, from the anticlinal centre near Karyes. Athos Peak is built up mainly of a grey-white crystalline limestone or marble, as it is often called. A similar marble is found, with narrower outcrop, near Chilandari on the other slope of the anticline. Exposures of conglomerate are also recorded by Grisebach (8) and Viquesnel (9). Metamorphic similar rocks to those of Athos Peninsula form the main mass of Chalkidike. Longos (Sithonia) is composed exclusively of grey gneiss, while Kassandra is entirely overlaid by Neogene (Young Tertiary, probably Pontic) deposits (6). In addition to the main anticline of Athos Peninsula, other, subsidiary, folds are discernible, especially to the north-west and south-east. The Peninsula is steeply faulted on both sides approximately parallel to its long axis (see maps in 2, 7, and 10). This faulting was no doubt contemporaneous with the foundering of the Aegean continent to form the Aegean Sea and was accompanied by other relative movements, up and down, of land and water. "The forming of the Aegean Sea and the joining of the Mediterranean and Black Seas by the old river-valley of the Bosphorus and Dardanelles altered the drainage system of the Balkan Peninsula and was a cause, together with the other tectonic movements, of the 'young' topography of many areas around the Aegean Sea" (3, p. 23). The apparently "young" topography superimposed on an old land surface can be well seen in many parts of Athos Peninsula, as in other areas of South Macedonia. Steep cliffs, high-angled slopes, narrow torrent-beds, masses of fallen rock debris, and the irregular sharp contouring of the Peak district, show that much weathering has yet to be done before a relatively stable equilibrium is reached.

Earthquakes are of common occurrence on Athos Peninsula and in neighbouring areas. The great earthquake of 26 September, 1932, did much damage in the Chalkidike and the northern parts of Athos Peninsula. The raw, almost bare, cliff above the sea-cliffs at the southern promontory of the Peninsula is said to have been formed by a great mass of rock falling into the sea when Athos was shaken by a terrible earthquake in 1905 (15, p. 92). In 1934 this great scar certainly looked younger than nearly 30 years; but it may be that scree still falls at intervals and prevents the natural primary succession which one would expect to be showing there.

No signs of soil acidity were noticed anywhere on Athos Peninsula, except perhaps the very local occurrence of *Polytrichum*. Two samples of soil were collected as likely to show extreme pH range, dried, and tested colorimetrically on return to Kew. The first was collected on the eastern side of the Peak, high above Lavra, at about 800 m., in the marble rock district. This is a deep dull red soil which gave strong bubbling reaction with HCl. Its pH was approximately 8.0. The second soil was collected amongst *Cistus macchia* on the hills behind Pyrgos. It is, in the dry condition,

a light grey-brown soil, derived from granite-like schists. It produced no bubbling on application of HCl, but gave a pH of approximately 7.5.

CLIMATE.

I have failed to find any published tables of temperature, rainfall, etc., for Athos Peninsula. My thanks are due to Dr. C. E. P. Brooks of the Air Ministry for his assistance in attempting to trace any published accounts.

The peculiar position, physiography, and altitudinal range of Athos Peninsula makes it impossible to be satisfied with records for such neighbouring stations as Salonika and Kavalla. One has perforce to be content with a few general and rather vague statements. The Peninsula has essentially a Mediterranean type of climate, with the maximum rainfall in the winter half of the year, relatively dry summers, and mild winters in the lower zones. On the ridge and peak these features are considerably modified by altitude. In April, snow was still present in considerable patches on the slopes of the peak, at about half-way up the eastern side of the peak deciduous trees had not or had scarcely burst their winter buds and the growth and flowering of the herbaceous vegetation had not commenced, except for a few very early spring plants. Heavy snow is said to be rare in the lower zones in winter, but it has been recorded (15, p. 142). Considerable floods from the slopes of the peak and of the ridge are not infrequent at the time of snow-melting on the highlands.

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HISTORY OF BOTANICAL EXPLORATION.

The earliest scientific records of vegetation on Athos Peninsula which have been traced are those of **Belon** ("Observations de plusieurs singularitez mémorables, trouvées en Grèce, etc." Paris, 1554). The following extract from Grisebach, *Spic.* 1, p. viii. (1843), is worth quoting: "Belon promus plagae orientalis indagator, a 1546 Thessalonica Byzantium conversus, Chalcidicen, peninsulam Hajion-Oros, ovam thracicam et Chersonesum peragravit et fragmenta quaedam botanica praecique de arboribus montis Athūs insulaeque Tassos tradidit."

The post-Linnean botanical history of Athos Peninsula apparently commences with the visit of **Sibthorp** in August 1787. In 1794, during his second journey to the Nearer East (1794-5), Sibthorp and his party appear to have spent a considerable period on Athos "where they were delayed for some time by Barbary pirates cruising in the neighbourhood" (*Dict. Nat. Biog.* **52**, 189: 1897). This delay may account for the relatively very thorough botanical exploration Sibthorp must have made, judging from his collections. Unfortunately no complete account of Sibthorp's travels has appeared. Extracts from his diary were published in Walpole's "Memoirs" (ed. 2, London, 1818), but without reference to his sojourn on Athos. Webber Smith, in a paper "On Mount Athos and its Monasteries," in *Journ. Roy. Geogr. Soc.* **7**, 61 (1837), gives a reference to Walpole's "Continuation of Memoirs," etc. p. 40, and says "I do not find any account recorded of English travellers having ascended to the summit of Athos since Dr. Sibthorp and Mr. Hawkins on the 12th of August, 1787, now nearly half a century ago, whose brief but excellent account of the ascent is comprised in a few lines." In the "Flora Graeca" (1806-40) and in the "Florae Graecae Prodrromus" (1806, 1813) Sibthorp's Athos plants are listed, described, and, in the Flora, many of them figured. There is unpublished manuscript of Sibthorp's at Oxford and amongst this there may be some account of Athos Peninsula and its vegetation. Sibthorp's herbarium and the original paintings of the Flora Graeca are in the Department of Botany of the University of Oxford. A few of Sibthorp's plants are at Kew and an account of these has been published in *Kew Bull.* 1926, 120.

Friedrichsthal accompanied Boué on his Turkish journeys in 1836 (see Boué: *La Turquie d'Europe*, 1, p. ix: 1840). Boissier, *Flor. Or.* 1, p. xv. (1867) gives the dates as 1838 and 1839. A letter from Friedrichsthal published in *Flora*, 19, 1, 221 (1836) gives the proposed route of his journey, which included Athos. Specimens collected by him on "Hajion-Oros" are quoted by Grisebach (e.g. *Spic.* 1, 11, 26, 222: 1843). Boué, l.c. 437, gives a "Catalogue d'une partie des plantes de la Turquie d'Europe," with many references to "mont Athos." This "Catalogue" is, however, a mere compilation, with the records for Athos extracted from Sibthorp's works, as indicated by the letter S.

Frivaldsky also must have visited or obtained specimens from Athos Peninsula previous to 1843 (? about 1834–36), if Grisebach be right in quoting him, as, e.g. in *Spic.* 1, 26 (1843) under *Trifolium medium* L., and l.c. 171, under *Silene inflata* Sm. var. *athoa*. I have, however, failed to satisfy myself on this.

Aucher-Eloy visited Athos Peninsula in 1836 (Boiss. *Flor. Or.* 1, p. xv: 1867). His plants were enumerated by Boissier in a series of papers commencing in *Anns. Sci. Nat. Ile. Sér.* 16, 347 (1841) and in the *Flora Orientalis* (1867–84, Suppl. 1888).

Grisebach was on Athos Peninsula in 1839. He certainly made the most of the 10 days he spent here (4–13 June) as is shown by the long and valuable account he gives of the vegetation, etc. in his "Reise durch Rumelien und nach Brussa" 1, 227 seq. (1841), and by the number of plants he collected and afterwards described in his "Spicilegium Florae rumelicae et bithynicae," 1843, 1844.

Tozer was on Athos Peninsula at least twice (June 1853 and August 1861). He makes many references to the vegetation in his book *The Highlands of Turkey*, 1, chapters 3–5 (1869). Some of his dried plants are at Kew, and an account of these has been published in *Kew Bull.* 1920, 29.

Orphanides collected on Athos Peninsula in 1862. Many of his plants are recorded in Boissier's *Flora Orientalis*. The *Leguminosae* of his herbarium at Athens were listed by Heldreich in a publication entitled "Catalogus Systematicus Herbarii Theodori G. Orphanidis," Florentiae, 1877.

Janka sailed from Kavalla and landed at Pantokratoros on 20 July 1871. In a letter published in *Oesterr. Bot. Zeitschr.* 21, 249 (1871) he gives an interesting and amusing account of his experiences and more important botanical finds. He was on the peninsula till near the end of July and climbed the peak twice.

Pichler collected on Athos in 1873 (July), judging from labels in *Herb. Kew.*, but no published account of his visit has been traced.

Celakovský, during the years 1884 and 1885, received from a Bohemian monk, domiciled in the monastery of Chilandari, a considerable number (about 150) of dried specimens, mainly, but not entirely, from the district round Chilandari. The monk's

name is given as Slavilor Breuer, which he changed to Sava (Sava Chilandarac) on taking the monastic vows. A useful account of this collection was published by Celakovský in Sitz. kgl. böhm. Gesell. Wiss. Prag, 1887, 528. A later collection made by Sava, mostly in 1896 and 1897, is listed by Toel and Rohlena in Sitz. kgl. böhm. Gesell. Wiss. Prag, 1902 (article XLIX—separate with pp. 1-8).

Sintenis and Bornmüller (Iter Turcicum 1891) made considerable collections on Athos Peninsula. References to their journey will be found in Oesterr. Bot. Zeitschr. 41, 218, 431 (1891).

Athos Peninsula was visited by **Formánek** in 1900. A list of his plants is included by C. Vandas in "Additamenta ad Floram Macedoniae et Thessaliae," in Mag. Bot. Lap. 4, 262 (1905).

Adamović spent some days on Athos Peninsula in May, 1905, and "den Berg Athos (Hagion Oros) von zwei Seiten aus bestieg" (Oesterr. Bot. Zeitschr. 55, 493: 1905). It was on this journey that he discovered *Corydalis Wettsteinii*, which he described as a new species in Oesterr. Bot. Zeitschr. 56, 174 (1906) with a photographic reproduction. Probably both the photograph and the description were made from material cultivated from plants collected in 1905.

Dimonie was apparently on Athos Peninsula in May 1909. Bornmüller, in Engl. Bot. Jahrb. 59, 491 (1925) quotes a specimen from him under the name *Astragalus tymphresteus* Boiss. et Spr. Mihail Dimonie was resident in Salonika, according to Vierhapper in Oesterr. Bot. Zeitschr. 59, 148 (1909).

Hartmann collected a small series of plants on Athos Peninsula in 1913 and 1914. These are included by Bornmüller in his Beiträge zur Flora Mazedoniens (in Engl. Bot. Jahrb. 59-61, see l.c. 59, 300: 1925). Species collected by him on Athos Peninsula have been described as new by several authors (e.g. Beauverd in Bull. Soc. Bot. Genève, 6, 153: 1914; Hayek in Oesterr. Bot. Zeitschr. 64, 359: 1914).

Mattfeld visited Athos Peninsula in 1926, mainly in connection with his studies on the *Abies* of the Balkan Peninsula. He gives a valuable account of the Athos *Abies* in Bibl. Bot. Heft 100 (1930), including (Tafel II) some fine photographic reproductions of the woods.

Wagner, in Fedde Repert. 38, 286/502-287/503 (1935) describes as new two species of *Centaurea* under the names *C. Huljakii* and *C. Sanctae-Annae*. The locality is given as "Athos circa 600 m." with no indication of collector or date, or type specimen.

Dawkins, during his visits to Athos Peninsula collected a number of plants which are now in the Kew Herbarium. They are referred to in his book "The Monks of Athos," London, 1936.

Grebenchikoff visited Athos Peninsula in August 1936, and made a valuable collection. A set of his plants is also at Kew.

VEGETATION.

The first impression, and a true one, which the botanist obtains on visiting Athos Peninsula is of the luxuriance and natural wildness of the vegetation over most of the area. This impression is the greater if he be already familiar with other districts of the Balkan Peninsula, or indeed, with other countries bordering the Mediterranean Basin. Grisebach (*Reise*, 1, 245 : 1841), compared the thickness and fulness of the vegetation in the "Holy Wood" with descriptions of tropical vegetation. It soon becomes apparent that this luxuriance of *macchie* and forest is due to the absence of large herds and flocks of domesticated animals. That the climate and soil are suited to a dense growth of vegetation is, of course, true; but Athos is not unique in the Balkan Peninsula in these environmental factors. One can in fact say that Athos Peninsula, south-east of the wall bounding the Holy Mountain, is a very typical and permanent area of "enclosure" to use Clements's term (*Journ. Ecol.* 22, 43 : 1934). The laws of the monastic republic ordain that no female animals shall be allowed on the territory. This law is strictly kept so far as the domestic mammalian herbivorous fauna is concerned. There are numerous hares, and, according to information received locally, some wild deer and wild pigs in the forests. These, however, are insufficient to affect the vegetation to any appreciable extent. Mules are used for transport, but, except around some of the larger monasteries, are not turned loose for grazing, and then only within very limited areas. Gardens, olive-groves, and some meadow-land occur round the buildings, but by far the greater part of Athos is covered with natural vegetation. Much of this is primitive in the sense in which this word has been defined for woodlands (Moss, Rankin, and Tansley, in *New Phyt.* 9, 113 : 1910). A certain amount of cutting of timber has probably taken place throughout historic times, but no planting. There are, indeed, considerable areas which, so far as can be judged from field observations, have never been exploited. Judicious cutting of tall trees probably does little or no harm to the natural vegetation. In the absence of flocks and herds rejuvenation occurs naturally and quickly. In other words a relatively short secondary succession speedily re-establishes the climax. On the other hand, the twenty monasteries own all the land, some of them are now very poor, sources of external income having been cut off entirely or much reduced since the world war, and timber is one of the chief potential sources of wealth for some of them. We gained the general impression that cutting had increased of late and that forests farther distant from the monasteries were being cut than was the former rule. A botanist can only express the fervent hope that exploitation will not increase to such a degree or in such a manner that rejuvenation cannot occur. If this were allowed not only would a botanically unique vegetation be destroyed but it would be a short-sighted economic policy for the monasteries, the monastic

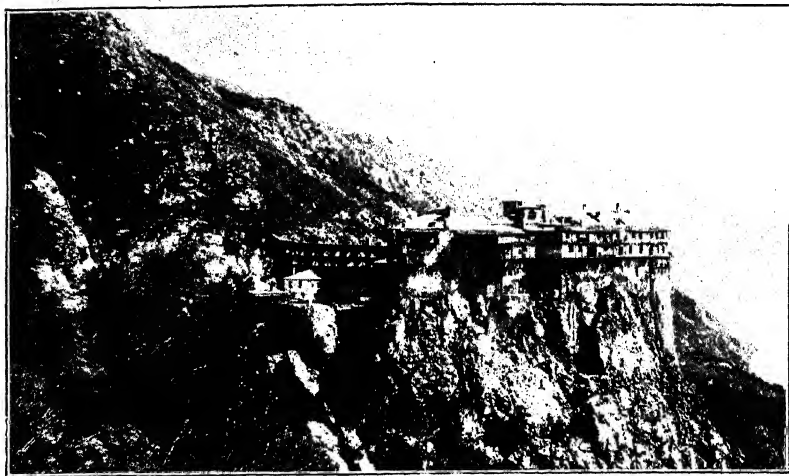
republic, and for the Greek nation which holds the secular overlordship.

The chief features of the vegetation may be described on the basis of altitudinal zonation.

Sea and coast. The Aegean Sea, in common with other divisions of the Mediterranean has very weak tides. As a consequence special coastal communities are little developed and there are no salt marshes, sand-dunes, or extensive shingle beaches. Often the rocks go down sheer into the sea. Where the sea-floor is not too deep and is sheltered extensive submarine meadows of *Posidonia oceanica* (L.) Del. occur, as around the Mulyani Islands and in the bay of Pyrgos. Sometimes, as near Pyrgos and also locally on the east coast, considerable quantities of broken leaves of this plant are cast up on shore by the waves in storms and dry a pale dirty straw colour. On the strand, which is usually narrow and covered with rocks and boulders, the scree of the cliffs and slopes, more rarely sandy or with water-worn pebbles, characteristic plants are: *Silene Fabaria* S. et S., *Glaucium flavum* Crantz [\pm var. *leiocarpum* (Boiss.) Stoy, et Stef.], *Medicago marina* L., *Armeria sancta* Janka, *Limonium angustifolium* (Tsch.) Turrill, *L. Gmelinii* (Willd.) O. Ktze., *L. sinuatum* (L.) Mill., *Calystegia Soldanella* (L.) R. Br. *Diotis maritima* Cass., *Eryngium maritimum* L., *Andryala dentata* S. et S., *Cynodon Dactylon* (L.) Pers., *Euphorbia Paralias* L., *Crithmum maritimum* L., *Spergularia rubra* (L.) Pers., *S. salina* J. et C. Presl, and *Cakile maritima* Scop.

Streams. In the valleys of streams near their junction with the sea, boulder-strewn beds of greater or less width are formed when the stream is in flood. The sides, and sometimes parts of the flood-bed, frequently have groves of plane, alder, willows (*Salix alba* L.), and *Tamarix tetrandra* Pall. A good example occurs near Chilandari arsenal. In April the planes had considerable quantities of the previous year's fruits, the seeds from samples of which germinated readily at Kew, with practically 100 per cent. germination. Other plants characteristic of stream beds and stream-sides are *Nerium oleander* L. and *Vitex Agnus-castus* L.

Aquatic and marsh plants. Habitats suitable for aquatic and marsh plants are of very local development and of small area. The most extensive water and wet areas are along the old line of Xerxes Canal, but smaller damp and at least semi-marsh areas occur on the plateau between (and above) Chilandari and the boundary wall, and elsewhere in the deciduous woods where springs outcrop. The ponds along the line of Xerxes Canal were in April white with flowering batrachian buttercups (*Ranunculus peltatus* Schrk. and *R. paucistamineus* Tsch.). The swamps linking up the open water ponds contained *Heleocharis palustris* (L.) R. Br., *Juncus bufonius* L., and *Ranunculus ophioglossifolius* Vill., and were bordered by abundant fully flowering *R. sardous* Cr. In other wet or damp spots on the Peninsula we found: *Nasturtium officinale* R. Br.,



1. Partly denuded hill-slopes behind Simopetra Monastery, with Athos Peak in the background.



2. Dense macchie on hill-slopes. Young plane trees in stream bed. Near Zographu.

Photos by N. Y. Sandwith.

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Montia verna Neck., *Carex distans* L., *C. divisa* Huds. var. *chaetophylla* (Steud.) Daneau, *Scirpus setaceus* (L.) Palla, *Arundo Donax* L., and, on a damp wall, *Saxifraga hederacea* L.

Macchie. The lower zones of the whole Peninsula are covered with macchie. That these largely sclerophyllous and evergreen brushwoods would repay very careful and detailed ecological study was evident from our observations. We, however, were on Athos Peninsula only for a relatively short period and at one season of the year. The following notes are therefore very incomplete but may serve to stimulate some ecologist with time available to undertake a thorough study. Four important facts may be mentioned: the considerable floristic richness of the macchie; the great variation in qualitative and quantitative composition in different parts; the comparatively large numbers of deciduous bushes and small trees in some macchie; and the great wealth of colour in April. These features were quickly apparent to one who knows macchie in other parts of the Balkan Peninsula.

The components of the high macchia (which can probably be further subdivided) may conveniently be divided into evergreen (sclerophyllous) and deciduous types. Of the former the following are especially characteristic: *Pinus halepensis* Mill., *Arbutus Andrachne* L., *A. Unedo* L., *Myrtus communis* L., *Olea europaea* L. subsp. *oleaster* (Hoffm. et Lk.) Fiori, *Laurus nobilis* L., *Quercus Ilex* L., *Smilax aspera* L. and its var. *mauritanica* (Desf.) Aschers. et Graebn., and *S. excelsa* L. Deciduous species include: *Cercis siliquastrum* L., *Coronilla emeroides* Boiss. et Sprun., *Crataegus monogyna* Jacq. (local), *Sorbus torminalis* (L.) Cr. (local), and *Fraxinus Ornus* L., with the climber *Tamus communis* L. var. *cretica* (L.) Boiss.

Lower macchie, from which the taller trees have probably been cut out for timber, contain as evergreen members *Cistus monspeliensis* L., *C. salviifolius* L., *C. villosus* L. subsp. *creticus* Hayek, *Rhamnus Alaternus* L., *Calycotome villosa* (Poir.) Lk., *Spartium junceum* L., *Erica arborea* L., *E. verticillata* Forsk., *Phillyrea media* L., *Osyris alba* L., *Quercus coccifera* L., and *Juniperus Oxycedrus* L.; and as deciduous members (? all completely deciduous) *Euphorbia acanthothamnos* Heldr. et Sart., *E. dendroides* L., and *Pistacia Terebinthus* L. At the higher boundary of the macchie *Quercus lanuginosa* (Lam.) Thuill. is to be found.

The occurrence and degree of dominance shown by *Pinus halepensis* Mill. varies greatly. Some macchie have *P. halepensis* in open or more or less closed canopy with dense macchie undergrowths. It must be remembered that *P. halepensis* is a tree with a relatively light canopy, casting much less shade than many other species of pine. An interesting community occupies a considerable area of the plateau above Chilandari in the direction of Pyrgos. Here high, but sometimes rather open, forest of *P. halepensis*, with a certain amount of *P. Pinea* L., has a thick undergrowth sometimes dominated by *Erica arborea* L. in an almost pure

community, or this mixed with *E. verticillata* Forsk. and *Arbutus Unedo* L. as co-dominants. A few bushes of *Calycotome villosa* (Poir.) Lk. and a species of *Pyrus* were noticed in other parts of the forest.

At the edges of the macchie, in open spaces between the trees and shrubs, and on the sides of paths through the macchie zone, a wealth of flowering herbaceous plants were at their best in April. Floristically, from the number of species in flower, this is the best spring collecting ground on Athos Peninsula. A considerable number of the plants belong to typical and widely distributed Mediterranean species, but some are of more local occurrence. Most of the species considered in this paragraph are light-demanding plants which cannot flourish in the dense macchie. The almost complete absence of grazing animals enables them to reach their maximum luxuriance. The following list, though not complete, indicates the floristic and ecological types which occur most commonly: *Anemone hortensis* L. var. *purpureo-violacea* (Boiss.), *Ranunculus rumelicus* Griseb., *Fumaria macrocarpa* Parl., *F. Thuretii* Boiss., *Alyssum umbellatum* Desv., *Aubrieta deltoidea* (L.) DC., *Biscutella ciliata* DC., *Brassica cretica* Lam., *Cardamine graeca* L., *Clypeola Jonthlaspi* L., *Crambe hispanica* L., *Lunaria annua* L. subsp. *pachyrhiza* (Borb.) Hayek, *Malcomia flexuosa* S. et S. (also on rocks near the sea), *Fumana thymifolia* (L.) Verl. var. *glutinosa* (L.) Burn., *Tuberaria guttata* (L.) Fourr., *Kohlruschia velutina* (Guss.) Reichb., *Hypericum Montbretii* Spach, *Geranium purpureum* Vill., *Astragalus macedonicus* Heldr. et Nadj, *Cytisus hirsutus* L., *C. triflorus* L'Hér., *Hymenocarpus circinnatus* (L.) Savi., *Lathyrus digitatus* (M. Bieb.) Fiori, *Lupinus angustifolius* L., *L. Termis* Forsk., *Ornithopus compressus* L., *Pisum elatius* Stev., *Trifolium subterraneum* L., *T. uniflorum* L., *Vicia grandiflora* Scop. var. *Kitaibeliana* Koch, *V. villosa* Roth, *Cotyledon pendulinus* (DC.) Batt., *Sedum glaucum* W. et K. var. *Buxbaumii* (Griseb.) Hayek, *Rubia Olivieri* Rich., *Valeriana Dioscoridis* S. et S., *Valerianella carinata* Lois., *Bellis hybrida* Ten., *Calendula arvensis* L., *Crupina Crupinastrum* (Moris) Vis., *Jurinea mollis* (L.) Reichb., *Lagoseris sancta* (L.) K. Maly, *Leontodon tuberosus* L. var. *Oliveri* (DC.) Hayek, *Phagnalon graecum* Boiss. et Heldr., *Scorzonera mollis* M. Bieb., *Senecio lividus* L., *Tragopogon dubius* Scop., *Campanula lingulata* W. et K., *Alkanna graeca* Boiss. et Sprun., *Anchusa italica* Retz., *A. officinalis* L. var. *moesiaca* (Vel.) Guşul., *Cynoglossum creticum* Mill., *Convolvulus elegantissimus* Mill., *Scrophularia heterophylla* Willd., subsp. *laciniata* (W. et K.) Maire et Petitm. var. *variegata* (Reichb.) Hayek, *S. peregrina* L., *Veronica Cymbalaria* Bod., *Orobanche Muteli* F. Schultz, *Ajuga chamaepitys* (L.) Schreb. var. *grandiflora* Vis., *Lamium garganicum* L. var. *glabratum* Griseb., *Salvia triloba* L. fil., *Stachys arvensis* L., *Thymus heterotrichus* Griseb., *Scleranthus dichotomus* Schur, *Aristolochia pallida* Willd., *Euphorbia dendroides* L., *E. oblongata* Griseb., *E. veneta* Willd., *Cephalanthera longifolia* (L.) Fritsch, *Orchis provincialis*

Balb., *O. quadripunctata* Cyr., *Serapias vomeracea* (Burm.) Briqu., *Iris Reichenbachii* Heuff., *Allium trifoliatum* Cyr., *Gagea amblyopetala* Boiss. et Heldr., *Ornithogalum tenuifolium* Guss., *Arisarum vulgare* Targ. Tozz., *Aira capillaris* Host.

The great earthquake scar near the point of Athos, between Kapsokalývia and Lavra, consists of cliffs, scree, and blocks of marble. There are, however, scattered plants which may be pioneers of a new succession, though, if 1905 be the date of the main fall, it is probable that the scree has not yet attained full stability. Species found as scattered individuals or in small colonies on the scree include: *Linum angustifolium* Huds., *L. elegans* Sprun. (a very beautiful plant), *Onosma paradoxum* Janka, and *Bromus sterilis* L. Marginal to the scree or tending to spread into it there also occurred: *Smyrniium Orphanidis* Boiss., *Picris pauciflora* Willd., *Tyrimnus leucographus* (L.) Cass., *Cerinth minor* L., *Orobanche lavandulacea* Reichb., *Scutellaria albida* L., *Euphorbia acanthothamnus* Heldr. et Sart., *E. dendroides* L., *Arum orientale* M. Bieb. subsp. *elongatum* (Stev.) Engl., and *Melica minuta* L.

In many parts of the Athos Peninsula, especially near the monasteries, on the north-western side, and above all between the boundary wall and Xerxes Canal the macchie have been considerably modified by cutting of the trees and larger shrubs and, in the last mentioned area, by grazing of sheep and goats owned by the refugee village of Pyrgos (Neo Prosforion). The stages of macchia degeneration under the destructive influence of man can be seen only too clearly in the north-west of the Peninsula. In the neighbourhood of the boundary wall a considerable amount of wood, largely for fuel, is undoubtedly poached, in addition to the cutting authorized by the monasteries. The depauperated macchie contain many of the low shrubs already mentioned, but are floristically much poorer and of much lower growth. There are more open spaces and, in the aggregate, considerable areas of ground bare of, or with a very shallow, soil. Excessive grazing results in extreme degeneration to phrygana, which may be termed a biotic proclimax. *Quercus coccifera* L., as a low prickly scrub, *Calycotome villosa* (Poir) Lk., *Phillyrea media* L., species of *Cistus*, and *Erica arborea* L., often form the main woody element. Where the deciduous *Paliurus spina-Christi* Mill. increases in number of individuals a transition to pseudo-macchia is noticed. Flat, extensively grazed areas, sometimes become thickets of *Asphodelus albus* Mill., as was seen on one of the Mulyani Islands. Near the Xerxes Canal a low phrygana was dominated by *Poterium spinosum* L. This was well within the grazing area of flocks and herds owned by the inhabitants of Erissos, indeed we saw large numbers of animals eating the poor forage provided by this plant community. Amongst the depauperated macchie, often protected by the prickly kermes oak where grazing animals occur, a considerable number of herbaceous plants contrive to exist or with the local exclusion of herbivores even to flourish.

Leguminosae are particularly abundant in some parts, and include : *Psoralea bituminosa* L., *Melilotus neapolitanus* Ten., and many clovers, including *Trifolium arvense* L., *T. campestre* Schreb., *T. glomeratum* L., *T. radiosum* Wahlenb., *T. scabrum* L., and *T. tomentosum* L. Other species occurring especially on hill-slopes with low or depauperated macchie are: *Silene Cucubalus* Wib., *Crucianella latifolia* L. var. *monspeliaca* (L.) DC., *Crepis neglecta* L., *C. pulchra* L., *Filago gallica* (L.) L., *Hedypnois rhagadioloides* (L.) Willd. subsp. *cretica* (L.) Hayek, *Pallenis spinosa* (L.) Cass., *Senecio vernalis* W. et K., *Taraxacum megalorrhizon* (Forsk.) Hand.-Mazz., *Zacintha verrucosa* Gaertn., *Bellardia Trixago* (L.) All., *Parentucellia latifolia* (L.) Cav., *Verbascum banaticum* Roth, *V. phoeniceum* L., *Orobanche caryophyllacea* Sm., *Salvia viridis* L., *Plantago Bellardi* All., *P. Lagopus* L., *Lagurus ovatus* L., and *Poa bulbosa* L.

Around some of the monasteries a few fields are kept as hay-meadows. One examined near Lavra had the following plants in flower: *Anemone hortensis* L. var. *purpureo-coerulea* (Boiss.), *Ranunculus eriophyllus* C. Koch, *Raphanus Raphanistrum* L., *Pisum elatius* Stev., *Vicia angustifolia* Reich., *Tordylium maximum* L., *Bellis hybrida* Ten., *Anthoxanthum odoratum* L., *Briza maxima* L., *Bromus maximus* Desf., *B. mollis* L. (s.l.), and *B. scoparius* Jusl. In a grassland area on the plateau above Chilandari the following grasses were in flower: *Anthoxanthum odoratum* L., *Bromus tectorum* L., *Holcus setigulumis* Boiss, et Reut., and *Hordeum leporinum* Link.

In cultivated arable fields in the Pyrgos and Erissos districts the following weeds were found: *Papaver hybridum* L., *Lepidium spinosum* Ard., *Silene gallica* L., *Lathyrus Aphaca* L., *Campanula phrygia* Jaub. et Spach, and *Legousia Speculum-Veneris* (L.) Fisch. In the fields of the Chalkidike Peninsula *Leontice Leontopetalum* L. was conspicuous in flower and fruit in April, but was not observed on Athos Peninsula. Around buildings *Hyoscyamus albus* L. was common. In waste places in the village of Pyrgos *Xanthium spinosum* L. and *Malva silvestris* L. were common, and *Heliotropium europaeum* L. and *H. suaveolens* M. Bieb. occurred amongst the stones of the main street.

On the walls of and around monastic buildings a number of interesting plants occur. Often the transition from rocks to walls can be traced, indicating rather clearly how plants can become semi-domesticated. Species found on walls include: *Fumaria capreolata* L. var. *albiflora* Hamm., *Sedum litoreum* Guss., *Galium murale* (L.) All., *Campanula Erinus* L., *C. rupestris* S. et S. subsp. *eu-rupestris* Hayek var. *Andrewsii* (DC.) Hayek, *Veronica arvensis* L., *Rosmarinus officinalis* L., *Sideritis romana* L., *Parietaria lusitanica* L., and *P. vulgaris* Hill.

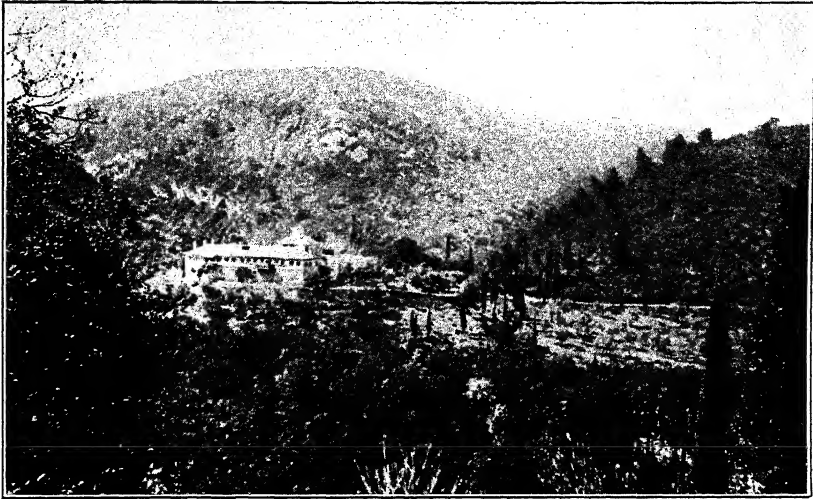
The group of islands in the north-eastern part of the Gulf of Athos are termed the Mulyani Islands. Three or four of the smaller islands opposite Pyrgos were visited. The smaller islets have a

natural undamaged open vegetation, the larger ones are heavily grazed. Sandy beaches and rocky stony ground predominate. Modified, in the grazed islands depauperated, macchie cover much of the ground. Even on the smallest islets visited *Quercus coccifera* L., occurred with galls of the kermes insect. The following species found on the islands are worth mentioning: *Berteroa orbiculata* DC., *Malcomia flexuosa* S. et S., *Matthiola sinuata* (L.) R. Br. subsp. *glandulosa* (Vis.) Vierh., *Viola Kitaibeliana* R. et S., *Cerastium illyricum* Ard., *Holosteum umbellatum* L. var. *hirsutum* Turrill, *Polycarpon tetraphyllum* L. var. *diphyllum* (Cav.) DC., *Silene colorata*, Poir., *Biserrula pelecinus* L., *Ornithopus perpusillus* (Mill.) Druce, *Vicia dasycarpa* Ten., *Tillaea muscosa* L., *Anthemis tomentosa* L. subsp. *peregrina* (L.) Hayek, *Centaurea Grisebachii* Nym., *Sonchus asper* (L.) Hill subsp. *glaucescens* (Jord.) Hayek, *Asterolinum linum-stellatum* (L.) Duby, *Herniaria hirsuta* L., *Euphorbia Peplis* L., *Muscari tenuiflorum* Tausch, *Avena barbata* Gott., *Catapodium loliaceum* (Huds.) Lk., *Lolium strictum* Presl, and *Ephedra campylopoda* C. A. Mey.

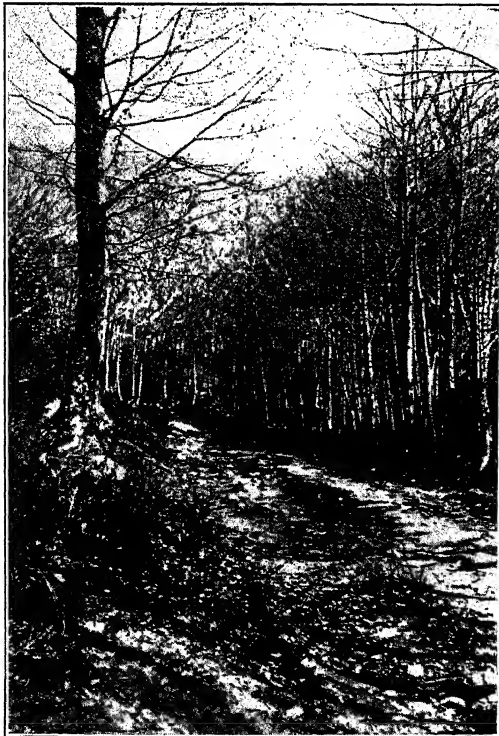
To sum up our observations on the macchia zone, it may be said that it is the zone *par excellence* of Mediterranean vegetation in Athos Peninsula. The very considerable number of species which occur is indicated by the lists given above. While in a short visit, covering a considerable distance, it was impossible to analyze the vegetation as it deserved, it was possible to note that different kinds of macchie occurred. Even amongst the tall, and often primitive, macchia types dominated by *Pinus halepensis* L. as a tree canopy, or by *Arbutus* spp., or by *Laurus nobilis* L., or by *Myrtus communis* L., differences in dominance were noticed in different parts of the Peninsula. These differences were certainly, at least in part, due to natural factors. While a macchia of mixed high growth can occur as undergrowth to *Pinus halepensis*, it can also occur in what appears to be a climax association so dense that seedlings of the light-demanding aleppo pine cannot establish themselves. The nature of the substratum and the speed with which the macchia shrubs "get away" are probably two of the factors determining the presence or absence of pine trees. The colour brilliance of the macchie (in the broad sense), especially on the west side of the Peninsula, in April was due to the large numbers of flowering shrubs and the masses of their flowers. Conspicuous from this standpoint were the deep lilac-purple of *Cercis* (much deeper in colour than any seen in cultivation in England), the gorse-yellow of *Calycotome villosa* (Poir) Link and *Coronilla emeroides* Boiss. et Sprun., and the white of *Fraxinus Ornus* L. and *Erica arborea* L. In addition the purple-red of the young shoots of *Quercus coccifera* L. and of the leaves and inflorescences of *Rhamnus Alaternus* L. and the often numerous and sometimes tall herbaceous plants in the less dense macchie added to the blaze of colour. The tall macchie, dominated by evergreen species (pines, strawberry-trees, laurel, myrtle, etc.)

were beautiful by contrast of their dark green restful foliage with the colour variation of the more open types.

Above the macchia zone a gradual transition to mixed or more or less alternating fir and deciduous woods occurs. Firs occur at as low an altitude as 3–400 m. and continue intermittently to the highest points of the main ridge, and other fir communities occur higher up on the Peak. *Viscum laxum* Boiss. et Reut. var. *Abietis* (Wiesb.) Hayek occurs as a parasite on the firs. Another ecological problem, of considerable interest, which can only be solved by detailed studies, is the relative distribution, and its underlying causes, of the fir and deciduous woods. One of the most marked consociations is that of the sweet chestnut (*Castanea sativa* Mill.). The trees are frequently pollarded in the more accessible woods and in April were leafless. The field layer of herbaceous plants in the *Castanea* woods had in flower in April: *Ranunculus Ficaria* L., *Corydalis Wettsteinii* Adamović, *Arabis Turrita* L., *Viola alba* Bess. subsp. *scotophylla* W. Becker var. *violacea* Wiesb., *V. Riviniana* Reichb., *Stellaria media* (L.) Vill., *Genista tinctoria* L., *Lathyrus venetus* (Mill.) Wohlf., *Vicia Barbazitae* Ten., *Saxifraga rotundifolia* L., *Cyclamen neapolitanum* Ten., *Myosotis cadmea* Boiss., *Symphytum bulbosum* Schimp., *Veronica Chamaedrys* L. var. *pilosa* (Schm.) Benth., *Lamium bifidum* Cyr., *Lamium striatum* S. et S. var. *glabratum* Griseb., *Rumex Acetosella* L., *Scilla bifolia* L., and *Luzula Forsteri* (Sm.) Lam. et DC. Some of these occurred also at lower altitudes. *Daphne Laureola* L. and *Ruscus Hypoglossum* L. were also frequent. Sometimes the woods were of a mixed association with firs and deciduous trees well scattered together. In such woods, in addition to *Castanea*, deciduous trees included oaks (in part *Quercus lanuginosa* (Lam.) Thuill.), lime (*Tilia* sp.), and poplar (*Populus nigra* L. var. *italica* Duroi). Undergrowth of holly or hazel was common, with, in places, a good deal of ivy or bracken. Hazel thickets are well developed round Karyes, and one derivation of the name of this, the administrative centre of the monastic republic, is from a Greek word for hazel. Other derivations are, however, accepted by some writers. A particularly interesting vegetation dominated by firs or by firs and mixed deciduous trees was visited on the east side of Athos peak. The transition from high macchia to fir wood was, along the path we took or made, unusually abrupt. The deciduous trees had, at about 800 m., for the most part not yet burst their buds, and this was also about the highest level of flowering for the early spring flower types in April. In addition to trees already mentioned *Acer platanoides* L. (just in flower), *Populus* sp. (*P. tremula* L.?), and *Ostrya carpinifolia* Scop. Plants of the field layer found in flower—most of them only just coming into flower—were: *Alliaria officinalis* Andr., *Alyssoides utriculatum* (L.) Med. var. *graecum* (Reut.) Hayek, *Cardamine hirsuta* L., *Hesperis glutinosa* Vis. var. *Visianii* (Fourn.) Hayek, *Isatis praecox* Kit., *Viola alba* Bess. subsp. *scotophylla* W. Becker var. *violacea* Wiesb., *Potentilla geoides* M. Bieb., *Euphorbia*



1. Macchie on hill-slopes, with most of the trees cut down. Near Zographu.



2. Deciduous pollarded *Castanea* trees, below the ridge, not far from Karyes.
Photos by N. Y. Sandwith.

amygdaloides L., *Galanthus nivalis*, L., *Fritillaria pontica* Wahlenb., and *Melica uniflora* Retz.

Grassy banks and slopes, well shaded and often damp occur not infrequently in the fir and deciduous tree zone. These were often gay with an early spring flora. Near Karyes, for example, on such a bank were noted in flower: *Arabidopsis Thaliana* (L.) Schur, *Arenaria serpyllifolia* L. var. *viscida* DC., *Cerastium brachypetalum* Desp. var. *eglandulosum* Fenzl., *C. glomeratum* Thuill., *Myosotis collina* Hoffm., *Symphytum ottomanum* Friv., *Lamium maculatum* L. var. *echinatum* Griseb., and *Fritillaria pontica* Wahlenb.

We did not climb to the top of Athos Peak, 1935 m. At about half-way up on the eastern slopes, it was obvious that flowering had hardly commenced in April. The Peak was, however, climbed by H. G. Tedd in July of the same year and his valuable collection is at Kew. The upper regions of the Peak have so many interesting plants that a list of some of them, from Tedd's collection, is given here: *Thalictrum minus* L. var. *olympicum* Boiss., *Isatis athoa* Boiss., *Helianthemum nitidum* Clem. var. *glabrum* (Koch), *Arenaria rotundifolia* M. Bieb. var. *pauciflora* Boiss., *Cerastium banaticum* (Roch.) Heuff., *Dianthus athous* Rech. fil., *Minuartia verna* (L.) Hiern subsp. *Gerardii* (Willd.) Graebn. var. *mediterranea* (Fzl.) Graebn., *Silene genistifolia* Hal., *Linum austriacum* L., *L. tenuifolium* L., *Anthyllis montana* L., *A. Vulneraria* L. subsp. *pulchella* (Vis.) Bornm., *Astragalus angustifolius* Lam. subsp. *pungens* (Willd.) Hayek, *A. parnassi* Boiss., *Saxifraga sancta* Griseb., *Sedum ochroleucum* Chaix, *Semprevivum marmoreum* Griseb., *Cnidium silaifolium* (Jacq.) Simk., *Pimpinella Tragium* Vill., *Asperula athoa* Boiss., *Galium asparagifolium* Boiss. et Heldr., *Pteroccephalus perennis* (L.) Coult., *Scabiosa Webbia* Don., *Anthemis Sibthorpii* Griseb., *Carduus armatus* Boiss. et Heldr., *Centaurea athoa* DC., *C. chalcidicaea* Hayek, *Helichrysum virgineum* (S. et S.) Boiss., *Campanula Orphanidea* Boiss., *C. rotundifolia* L. subsp. *sancta* Hayek, *Calamintha alpina* (L.) Lam. var. *granatensis* (Boiss. et Reut.) Hal., *Nepeta Sibthorpii* Benth., *Phlomis samia* L., *Teucrium montanum* L., *Thymus Jankae* Čel., *T. ocheus* Heldr. et Sart., *T. Tosevii*, Vel., *Daphne oleoides* Schreb. var. *glandulosa* (Bertol.) Keissl., *Agropyron sanctum* (Janka) Hack., *Bromus fibrosus* Hack., *Koeleria splendens* Presl, and *Poa alpina* L.

The zonation of the Peninsula and Peak is given at length by Grisebach (Reise 1, 294 seq.: 1841). Mattfeld (Bibl. Bot. Heft 100, 32 seq.: 1930) discusses the distribution of the firs and fir-woods and corrects some of Grisebach's altitudinal measurements.

Cultivation on Athos Peninsula is limited to the fields and groves, recently considerably extended by refugee influx, around Pyrgos, to the north-west of the boundary wall of the Holy Mountain and between this and Xerzes Canal, and to limited areas around the monasteries, sketes, and other monastic buildings. Conspicuously associated with many of the monasteries are cypress trees [*Cupressus sempervirens*, L. var. *pyramidalis* (Targ. Tozz.) Nym.] and *Wistaria*.

Olive groves are not uncommon, but on the Holy Mountain are rarely extensive. Oranges, lemons, and quinces are cultivated and large quantities of vegetables and salads are grown for home consumption. Vines are grown in many of the monastery and other gardens for wine-making.

GEOGRAPHICAL DISTRIBUTION.

The plants collected on Athos Peninsula, and enumerated in the Systematic List, number 435 species of Spermatophyta, apart from a number of Cryptogams not considered in this section. The geographical distributions, outlined for the species, may be summarized as follows :

1. Widely distributed through the E.N. Temperate Region or more widely : 69.
2. Europe general, including also the Mediterranean Basin or Mediterranean Region : 78.
3. Mediterranean Region : 60.
4. Mediterranean Basin : 97.
5. E. Mediterranean Basin and Oriental : 56.
6. S. Europe : 7.
7. Central Europe : 16.
8. Balkan Peninsular types or Balkan Peninsular endemics : 40.
9. Athos Peninsular endemics : 12.

The predominant Mediterranean character of the flora is indicated by the facts that 419 species have, wholly or in part, a Mediterranean distribution, and 272 species entirely a Mediterranean distribution (including Balkan Peninsular). The term Mediterranean is here used in the sense of the Mediterranean Botanical Region. The 16 Central European species alone indicate a very minor strictly northern element.

Some examples may be given of and remarks made concerning the plants of more limited distribution (5 to 9 as numbered above). The remarks give some general indications of the floristic history.

Species of more or less limited distribution in the E. Mediterranean Basin are often limited to countries bordering the Aegean Sea. They are part of the large floristic element which clearly indicates the essential climatic unity and common geological history of much of the now disrupted Aegean continent. Some extend some distance beyond the Aegean boundaries and may represent either species which have spread outwards, or have migrated to our area, or have become differentiated, over (approximately) their present distributional area, from some parental species. Examples of plants whose distribution has been classified under this heading are : *Aubrieta deltoidea* (L.) DC., *Malcomia flexuosa* S. et S., *Silene Fabaria* S. et S., *Hypericum olympicum* L., *Coronilla cretica* L., *Lotus peregrinus* L., *Trifolium radiosum* Wahlenb., *Saxifraga hederacea*, L., *Sedum litoreum* Griseb., *Rubia Olivieri* Rich., *Andryala dentata* S. et S., *Phagnalon graecum* Boiss. et Heldr., *Campanula phrygia* Jaub.

et Spach, *Arbutus Andrachne* L., *Erica verticillata* Forsk., *Myosotis cadmea* Boiss., *Lamium striatum* S. et S., *Phlomis samia*, L., *Euphorbia acanthothamnus* Heldr. et Sart., *E. graeca* Boiss. et Sprun., *Platanus orientalis* L., *Arum orientale* M.B., and *Cupressus sempervirens* L.

The South European types are of more limited distribution and, for our flora, represent mainly a western element. Representatives are: *Cardamine graeca* L., *Vicia Barbazitae* Ten. et Guss., *Bellis hybrida* Ten., *Cyclamen neapolitanum* Ten., *Scleranthus dichotomus* Schur, and *Ornithogalum tenuifolium* Guss.

The Central European types include some whose distribution is essentially south-east European (Dacian and Pannonian). It is naturally suggested that they reached Athos Peninsula (or the old Aegean continent) from the north. Many of them reach their southern limit in our area or in a corresponding latitude. Species grouped in this class include: *Erysimum crepidifolium* Reichb., *Isatis praecox* Kit., *Cnidium silaifolium* (Jacq.) Simk., *Leontodon crispus* Vill., *Campanula lingulata* W. et K., *Myosotis versicolor* Sm., *Verbascum banaticum* Roch., *Daphne Laureola* L., *Iris Reichenbachii* Heuff., and *Melica uniflora* Retz.

While the number of species classified as Central European is small (16), it must be pointed out that some species classified as of wide E.N. Temperate distribution or as general European, and some classified as Balkan Peninsular types or Balkan Peninsular endemics are also northern in their general distribution relative to Athos Peninsula. Extracting these, and adding on the 16 species classed as Central European, a total of 42 species is obtained as representing a relatively northern element in our list.

The Balkan Peninsular types and Balkan Peninsular endemics are species which either originated within the boundaries of the Balkan Peninsula and have spread little or not at all beyond them, or are relict species which have been exterminated elsewhere. They have previously been dealt with more fully [Turrill: *Plant-Life of the Balkan Peninsula*, pp. 422-465 (1929)]. Examples from our present list are: *Berteroa orbiculata* DC., *Hesperis glutinosa* Vis., *Viola athis* W. Becker, *Hypericum Montbretii* Spach, *H. rhodoppeum* Friv., *Linum elegans* Sprun., *Astragalus angustifolius* Lam., *A. macedonicus* Hal. et Nadj., *Trifolium dolopium* Heldr. et Hausskn., *Saxifraga Grisebachii* Deg. et Dörf., *Sempervivum marmoreum* Griseb., *Smyrniolum Orphanidis* Boiss., *Pteroccephalus perennis* (L.) Coult., *Carduus armatus* B. et H., *Centaurea Grisebachii* Nym., *Campanula Orphanidis* Boiss., *C. rupestris* S. et S., *Alkanna graeca* Boiss. et Sprun., *Onosma ottomanum* Friv., *Nepeta Sibthorpii* Benth., *Thymus heterotrichus* Griseb., *T. ocheus* Heldr. et Sart., *Euphorbia oblongata* Griseb., *Ophrys Reynholdii* H. Fleischm., *Agropyron sanctum* (Janka) Hack., and *Bromus fibrosus* Hack.

Many of these show how Athos Peninsula has shared in the characteristic floral wealth of the Balkan Peninsula. A few species, such as *Viola athis* W. Becker and *Agropyron sanctum* (Janka)

Hack. are nearly endemic to Athos Peninsula, the former being recorded only (and doubtfully) from S. Macedonia and the latter only from Thessaly, outside our area.

That the flora of an area so small as Athos Peninsula should have as many as about 20 endemic species, gives some indication of the special botanical interest of Aegean lands. Twelve of the species in our list are, so far as is known, to be found native only on Athos Peninsula. The full list of these is: *Corydalis Wettsteinii* Adamov., *Isatis athoa* Boiss., *Dianthus athous* Rech. fil., *Silene genistifolia* Hal., *Asperula athoa* Boiss., *Anthemis Sibihorpii* Griseb., *Centaurea athoa* DC., *C. chalcidicea* Hayek, *C. pannosa* DC., *Helichrysum virgineum* (S. et S.) Boiss., *Armeria sancta* Janka, *Onosma paradoxum* Janka. Some of these, such as *Corydalis Wettsteinii* and *Onosma paradoxum*, have been considered as subspecies or varieties of more widely distributed species by some authors (e.g., Hayek). The others, however, are well-defined species, sometimes of no very close affinity with other existing species. These may be regarded as relict species or at least such as suggest long isolation of the species from existing lands.

SYSTEMATIC LIST.

RANUNCULACEAE.

Anemone hortensis L. Sp. Pl. 540 (1753) var. **purpureo-violacea** (Boiss.). *Anemone fulgens* J. Gay var. *purpureo-violacea* Boiss. Flor. Or. 1, 12 (1867). *A. hortensis* L. var. *pavonina* (Lam.) Gren. et Godr. subvar. *purpureo-violacea* (Boiss.) Hayek, Prodr. 1, 319 (1924).

Asbestochori Cemetery, north of Salonika, 11.4.34, in stony grassland, no. 2591; Simopetra, just above the arsenal, 13.4.34, stony open places in the macchia, no. 2370; near Karyes, 13.4.34, in grassy places, no. 2373.

No. 2591 had flowers with bright mauve sepals; no. 2373 had pale mauve sepals, with or without a white blotch, but the plants showed a considerable range in width, shape, and number of sepals.

A. hortensis L. var. **fulgens** (DC.). *A. pavonina* Lam. var. (?) *fulgens* DC. Prodr. 1, 18 (1824). *A. hortensis* L. var. *pavonina* (Lam.) Gren. et Godr. subvar. *fulgens* (DC.) Hayek Prodr. 1, 319 (1924).

Mulyani Islands: second small island off Pyrgos, 15.4.34, in depauperated pseudomacchia and old olive groves, no. 2383.

Sepals bright scarlet, monochrome or with white or dark base.

The intraspecific variation of *A. hortensis* L., sensu lato, requires investigation from the cyto-genetical standpoint, but such an investigation should be, at least largely, on material of known wild origin and should be combined with a taxonomic and phytogeographical study of wild populations. The distribution of the var. (?) *purpureo-violacea* (Boiss.) suggests it may have to be given a somewhat higher taxonomic status.

Distribution (of species): Mediterranean Basin and generally in the Mediterranean districts of the Balkan Peninsula.

Nigella arvensis L. Sp. Pl. 534 (1753).

Mulyani Islands: "Frying Pan Island," 5.6.34, Mrs. Lock no. 16.

Distribution: Mediterranean Region, Central Europe, and Caucasus, and in most districts of the Balkan Peninsula.

Ranunculus eriophyllus C. Koch in Linnaea, 19, 46 (1847).

Lavra, near the monastery, 20.4.34, in tall herbage of a grassy hay meadow, no. 2532.

Distribution : Oriental, and in the southern and eastern districts of the Balkan Peninsula.

R. Ficaria L. Sp. Pl. 550 (1753).

Cultivated in the Herbarium Experimental Ground, as K. 1394, from tubers collected between Simopetra and Karyes, 13.4.34, in *Castanea* woods ; in flower at Kew 27.3.36.

The plant seems typical *R. Ficaria* L. and not *R. Ficaria grandiflora* F. Schultz, which latter is fairly widely distributed in South Europe. See Bot. Mag. t. 9199 (1930).

Distribution : Europe (general) and the Caucasus, and recorded from most districts of the Balkan Peninsula.

R. ophioglossifolius Vill. Hist. Pl. Dauph. 4, 731 (1789).

Near the Xerxes Canal, 17.4.34, in marshy muddy ground, No. 2440 ; plateau between Chilandari and Pyrgos, 23.4.34, in damp marshy ground, no 2689.

The degree of hairiness of the flower-stalks and inflorescence branches varies very considerably.

Distribution : Mediterranean Region, Caucasus, and most districts of the Balkan Peninsula.

R. paucistamineus Tsch. in Flora 17, 525 (1834).

Pond in the line of Xerxes Canal, 17.4.34, in water, no. 2441.

Submerged leaves only, not collapsing. Flowers relatively small.

Distribution : East North Temperate Region, and generally distributed in the Balkan Peninsula.

R. peltatus Schrk. Bayr. Flor. 2, 103 (1789).

Pond in the line of Xerxes Canal, 17.4.34, in water, no. 2442.

With conspicuous floating leaves. Flowers relatively large.

Distribution : East North Temperate Region, and so far recorded from Greece, Cyclades, S. Macedonia, Dalmatia, in the Balkan Peninsula.

R. rumelicus Griseb. Spic. 1, 305 (1843).

Above Simopetra, 13.4.34, stony rather dry places, no. 2325.

Distribution : Eastern Mediterranean Basin and southern, central, and eastern districts of the Balkan Peninsula.

R. sardous Crantz Stirp. Austr. 2, 84 (1762).

Abundant along the site of Xerxes Canal, 17.4.34, in damp places, no. 2446.

Distribution : Mediterranean Basin, Central Europe, and Caucasus, and from nearly all the districts of the Balkan Peninsula.

Thalictrum minus L. Sp. Pl. 546 (1753) var. **olympicum Boiss.** Flor. Or. 1, 8 (1867).

Mt. Athos peak, 1700–1900 m., among rocks, *H. G. Tedd*, no. 1490.

Height about 3 dm., flowers yellowish. Plant infrequent.

Distribution : (of species) North Temperate Region and from most districts of the Balkan Peninsula ; (of variety) mountains of northern Greece, Thessaly, Epirus, and Athos, doubtfully also from Caucasus.

PAPAVERACEAE.

Corydalis Wettsteinii Adamović in Oesterr. Bot. Zeitschr. 56, 174 (1906).

C. solida (L.) Sw. subsp. *Wettsteinii* (Adamov.) Hayek Prodr. 1, 365 (1925).

High above Karyes, 13.4.34, field-layer in *Castanea* woods, no. 2305 ; cultivated in Herbarium Experimental Ground, from tuber collected above Karyes, 13.4.34, in flower at Kew, 27.3.36.

Flowers very pale pink, the wings tipped with purple. The species in cultivation at Kew is easily damaged by late spring frosts, and suffered badly from those of the spring of 1935.

Distribution : Athos Peninsula (endemic).

Fumaria capreolata L. Sp. Pl. 701 (1753) var. **albiflora** Hamm. Mon. slägt. Fum. 25 (1857).

Panteleemon, 14.4.34, on walls of outhouse of the monastery, no. 2271.

Corolla white, tips of wings blackish-purple.

Distribution : (of species) Mediterranean Basin and Central Europe and Mediterranean and transitional districts of the Balkan Peninsula.

F. flabellata Gasp. Rend. Acad. Nap. 1, 51 (1842) sec. Pugsley in Journ. Linn. Soc. 44, 266 (1919).

Mulyani Islands: small island opposite Pyrgos, 13.4.34, coll. H. G. Chick, no. 2636.

White and dark purple flowers.

Distribution : Mediterranean Basin, but of a rather discontinuous distribution, recorded from Montenegro and Dalmatia in the Balkan Peninsula.

F. judaica Boiss. Diagn. Ser. 1, viii. 15 (1849).

Kapsokalyvia, 19.4.34, under walls on dry bushy slopes above sea, no. 2470.

Flowers very pale pink and not blackish at the tips.

Distribution : East Mediterranean Basin and Egypt; recorded from the Cyclades, Dalmatia, and Istria.

F. macrocarpa Parl. Plant. nov. 5 (1842).

Simopetra, between arsenal and monastery, 13.4.34, no. 2289.

Flowers very pale pink, upper and lower petals greenish at tips, wings darker at tip. Fruits large.

Distribution : Oriental, and from Crete, Greece, Cyclades, S. Macedonia, and Dalmatia.

F. Thuretii Boiss. Diagn. Ser. 2, i. 15 (1853), near var. **pikermiana** (Boiss. et. Heldr.) Pugsley in Journ. Linn. Soc. 44, 294 (1919).

Mulyani Islands: small island opposite Pyrgos, 15.4.34, in brushwood, coll. H. G. Chick, no. 2393; Simopetra, between monastery and arsenal, 13.4.34, between stones no. 2298.

Flowers recurved, rose-pink wings, blackish-purple at tips.

Distribution (of species): centred in the Balkan Peninsula, especially in the south and west, but extending to northern Asia Minor and the Banat, and also recorded from Cyprus.

Glaucium flavum Crantz, Stirp. Austr. fasc. ii. 133 (1763) more or less approximating to the var. **leiocarpum** (Boiss.) Stoy. et Stef.

Panteleemon, 14.4.34, stony places against the base of the monastery buildings and walls, no. 2263, petals yellow without blotch; east of Pyrgos, 24.4.34, sandy shore south-east of the boundary wall of the Holy Mountain, no. 2721, flowers pale yellow, with dark blotch at petal base.

Distribution (of species): coastal districts of Europe and the Mediterranean Basin east to the Caucasus; (of variety) essentially East Mediterranean Basin.

The variation of *G. flavum* has been recorded in Kew Bull. 1933, 174.

In addition to the collected specimens enumerated above series of plants have been grown in the Herbarium Ground at Kew from seeds collected on the Athos Peninsula. These include the following:

K. 1441, east of Pyrgos, south-east of the boundary wall of the Holy Mountain, seeds collected 24.4.34, plants in flower at Kew 20.8.35. Petal blotch well marked.

K. 1459, Panteleemon, seeds collected 14.4.34, plants in flower at Kew 20.8.35. Petal blotch almost obsolete on both surfaces.

K. 1468, Pantocratoros, seeds collected 21.4.34, plants in flower at Kew 20.8.35. Petal blotch well marked on outer (lower) surface.

K. 1540, 1541, near Pantocratoros, seeds collected 11.7.34, H. G. Tedd, in flower at Kew 8.8.35 and 29.8.36. No petal blotch on outer (lower) surface, faint on inner (upper) surface.

The above numbers represent about 40 individual plants. These showed a wide range of variation in the degree of bristle development on the sepals (from strongly setose to completely glabrous) and in the degree of roughness of the fruits (from distinctly asperous to quite smooth), as well as in the petal markings. All the plants, however, have fruits rather more slender than those of Western European *G. flavum*, though there is some variation in this character.

Hypocoum grandiflorum Benih. Cat. Pyr. 91 (1826).

Lembet Cemetery, north of Salonika, Greek Macedonia, 11.4.34, grassy and waste places, no. 2623.

Deep yellow-orange flowers.

Distribution : Mediterranean Region and Caucasus ; widely spread in the Balkan Peninsula.

H. procumbens L. Sp. Pl. 124 (1753) var. **glaucescens** (Guss.) Heldr. in Bull. Herb. Boiss. 6, 232 (1898).

Head of Cassandra Gulf, Greek Macedonia, 12.4.34, sandy ground not far from the sea, no. 2628.

Distribution : Mediterranean Region ; Mediterranean districts of the Balkan Peninsula.

Papaver hybridum L. Sp. Pl. 506 (1753).

Above Pyrgos, 25.4.34, in cornfields on hill slopes, no. 2751.

Petals crimson.

Distribution : E. N. Temperate Region ; widespread in the Balkan Peninsula.

Roemeria hybrida (L.) DC. Syst. 2, 92 (1821).

Head of Cassandra Gulf, Greek Macedonia, 12.4.34, sandy place not far from the sea, no. 2631.

Distribution : E. N. Temperate Region ; Mediterranean and Transitional districts of the Balkan Peninsula.

CRUCIFERAE.

Alliaria officinalis Andrzej. in M. Bieb. Flor. Taur.-Cauc. 3, 445 (1819).

High above Lavra, 620 m., on slopes of Athos peak, 20.4.34, shady stony ground in *Abies* zone, no. 2522.

Distribution : E. N. Temperate Region ; general in the Balkan Peninsula, except Crete.

Alyssoides utriculatum (L.) Med. Phil. Bot. 1, 189 (1789) var. **graecum** (Reut.) Hayek Prodr. 1, 443 (1925).

Kapsokalyvia, 19.4.34, among stones on hot, dry, limestone slopes, no. 2474.

High above Lavra, 815 m., on slopes of Athos peak, 20.4.34, on open limestone rocks above lower *Abies* zone, no. 2524.

Petals yellow to bright yellow.

Distribution (of var.) : Balkan Peninsula, fairly widespread, extending to Italy and Bithynia.

Alyssum desertorum Stapf in Denkschr. Akad. Wiss. Wien 51, 302 (1886).

Mikra Cemetery, north of Salonika, Greek Macedonia, 11.4.34, dry stony ground, no. 2664.

Distribution : E. N. Temperate Region ; fairly widespread in the Balkan Peninsula, especially in the central and southern districts.

A. murale W. et K. Pl. Rar. Hung. 1, 5, t. 6 (1802).

Near the Russian skete, east of Pyrgos, just within the boundary wall of the Holy Mountain, 23.4.34, on stony ground, no. 2709.

Distribution : Balkan Peninsular type, fairly widespread (not Crete), and extending to north and south-east.

A. parviflorum Fisch. ex M. Bieb. Flor. Taur.-Cauc. 3, 434 (1819).

Asbestochori Cemetery, north of Salonika, Greek Macedonia, 11.4.34, dry stony ground, no. 2587.

Distribution: Central Europe, Mediterranean Basin, and Caucasus; widespread in the Balkan Peninsula.

A. umbellatum Desv. Journ. Bot. 3, 173 et 184 (1814).

Simopetra, between the arsenal and the monastery, 13.4.34, in dry stony ground, nos. 2346, 2350; Mulyani Islands: small island off Pyrgos, 15.4.34, dry stony places, no. 2396.

Pale yellow petals.

The branches of the hairs on the silicules of no. 2396 are rather longer than on the fruits of the other two numbers. A similar range in indumentum is to be seen in Asia Minor and Syrian material at Kew.

Distribution: Oriental; Cyclades, N. Macedonia, Thrace.

Arabidopsis Thaliana (L.) Schur Enum. Plant. Transs. 55 (1866).

Near Karyes, 13.4.34, on grassy bank, no. 2377.

Distribution: General European, Mediterranean Region, Caucasus; general in the Balkan Peninsula.

Arabis Turruta L. Sp. Pl. 665 (1753).

Above Karyes, 14.4.34, in woods in shade, no. 2309.

Distribution: General European, Mediterranean Basin, east to Caucasus; general in the Balkan Peninsula (except Crete).

A. verna (L.) R. Br. in Ait. Hort. Kew. ed. 2, 4, 105 (1812).

High above Lavra, 620 m., on slopes of Athos peak, 20.4.34, stony shady ground in *Abies* zone, no. 2521.

Petals purple.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts in the Balkan Peninsula.

Aubrieta deltoidea (L.) DC. Syst. 2, 294 (1821).

Below Zographu Monastery, 16.4.34, stony ground in macchia zone, no. 2429.

Distribution: Oriental; southern and Transitional districts in the Balkan Peninsula.

Berteroa sp. probably *B. incana* (L.) DC. Syst. 2, 291 (1811) var. *stricta* (Boiss.) Turrill in Kew Bull. 1920, 181.

Between Pyrgos and Xerxes Canal, 17.4.34, grassy ground by roadside, below macchia, no. 2454; head of Cassandra Gulf, Greek Macedonia, 12.4.34, no. 2627.

Petals white.

The specimens are too young for certain identification.

B. orbiculata DC. Syst. 2, 293 (1821).

Mulyani Islands: small island off Pyrgos, 25.4.34, on the dry, grassy, and rather flat top of the island, no. 2764.

Growing with no. 2763 (see immediately below) and similar to it except that the fruits are densely hairy with stellate and simple hairs.

Distribution: a Balkan Peninsular type extending to N. Asia Minor; N. and S. Macedonia, N. Bulgaria, Rodope Massif.

B. orbiculata DC. var. *glabra* Turrill var. nov. siliculis glabris vel fere glabris distinguitur.

Foot of cliff leading to Simopetra monastery, spring 1932, *H. G. Chick* 60; in ravine by shore, Aghios Dionysios, spring 1932, *H. G. Chick* 70; Mulyani Islands: small island off Pyrgos, 25.4.34, dry grassy and stony flat top of the island, no. 2763, flowers yellow fading to cream, fruit glabrous or with a very few stiff simple hairs (type); between the arsenal and the monastery of Simopetra, 13.4.34, stony open places in the macchia zone, no. 2287.

Hayek, in Prodr. 1, 427 (1925) makes the new combination *Berteroa samolifolia* (Desf.) Hayek for *B. orbiculata* DC. This combination is based on the identification of *Alyssum samolifolium* Desf. Choix de Plantes 66, t. 49 (1808) with *B. orbiculata* DC. Neither the description nor the figure agree with this latter, and the plant is said to come from Armenia. In *A. samolifolium* the whole plant is said to be glabrous and the petals white. Neither of these characters is true for *B. orbiculata*. The latter was described from material collected by D'Urville "in arenosis ad Xerxis canalem" and the original description fits very well our no. 2764, except that the nearly mature silicles in the new material are somewhat longer.

Biscutella ciliata DC. in Ann. Mus. Nat. 18, 297 (1811) sensu Machatschki-Laurich in Bot. Archiv. 13, 30 (1926).

Below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2426; cultivated, as K. 1482, in the Herbarium Experimental Ground, Kew, 13.7.35, from seed collected in the same locality at the same time.

Distribution: Mediterranean Basin; Mediterranean districts of the Balkan Peninsula.

Under the older classification of Halácsy our material fits into *B. didyma* L. var. *leiocarpa* (DC.) Hal. Conspectus 1, 105 (1901).

Brassica cretica Lam. Encycl. 1, 747 (1783).

Above Simopetra, 13.4.34, growing in rock crevices in open places between high macchia, no. 2332.

Distribution: Oriental; Crete, Greece, Cyclades, Corfu, Athos Peninsula.

The plants grow to large size and the flowers have pale yellow petals.

Accounts of this interesting species will be found in the Pflanzenreich iv. 105, 36 (1919) by O. E. Schulz and in Oesterr. Bot. Zeitschr 82, 309 (1933) by Max Onno. In the former work, Athos plants are included in the type, in the latter in the var. *nivea* (Boiss. et Sprun.) O. E. Schulz. The var. *nivea* was described (as a species) in Boiss. Diagn. I. 1, 72 (1847) from material collected at Acrocorinth. The petals are definitely said to be white, a character whence the epithet *nivea* is derived. In our Simopetra material the petals are definitely yellow on the living plant, hence either Onno is incorrect or both the type and the variety occur on the Athos Peninsula.

Cakile maritima Scop. Flor. Carn. 2, ed 2, 35 (1772).

South-east of Pyrgos, 24.4.34, among stones by the sea, no. 2743. Petals lilac.

Distribution: General European and Mediterranean Basin east to the Caucasus; general in coastal parts of the Balkan Peninsula.

Calepina irregularis (Asso) Thell. in Schinz u. Thell. Flor. Schw. ed. 2, 1, 218 (1905).

Asbestochori Cemetery, north of Salonika, dry stony ground, no. 2616.

Distribution: Central European and Mediterranean Regions east to Caucasus; fairly widespread in the Balkan Peninsula.

Camelina rumelica Vel. in Sitz. böhm. Ges. Wiss. 448 (1887).

Head of Cassandra Gulf, Chalkidike Peninsula, 12.4.34, no. 2632.

White petals. The species is very close to *C. microcarpa* Andr.

Distribution: Balkan Peninsular type; Greece, N. and S. Macedonia, Thrace, N. and S. Bulgaria, Serbia.

Capsella Bursa-pastoris (L.) Moench. Meth. 271 (1794). Mikra Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2593.

Distribution: now more or less cosmopolitan; widespread in the Balkan Peninsula.

Cardamine graeca L. Sp. Pl. 655 (1753).

Simopetra, between the monastery and the arsenal, 13.4.34, grassy places in half shade, no. 2360 and wall crevices and slopes, no. 2294.

Distribution: South European; widespread in Mediterranean and Transitional districts in the Balkan Peninsula.

C. hirsuta L. Sp. Pl. 655 (1753).

Above Lavra, 770 m., slopes of Athos peak, 20.4.34, in stony ground in mixed *Abies* and broad-leaved forest, no. 2515.

Distribution : North Temperate Region; general in the Balkan Peninsula.

Clypeola Jonthlaspi L. Sp. Pl. 652 (1753).

In the Kew Bulletin 1935, 1, an account was published of the genus *Clypeola* and its intraspecific variation. In this account our Athos and other South Macedonian specimens of *C. Jonthlaspi* were referred to varieties based on fruit size, indumentum, and shape. In addition to these specimens a number of packets of seeds were collected which were sown in pots and grown in the insect-proof house of the Herbarium Ground, Kew, 1935. The following results were obtained :

Index number.	Locality.	Fruits sown, indumentum and diam. in mm.	Approximate number of plants grown.	Fruits of offspring.
K.1496 ...	Athos, Simopetra ...	w H d H 2.5-2.75	75	All w H d H 2.5-2.75
K.1497 ...	Athos, above Lavra	w H d H 4.0	25	All w H d H 4.0
K.1498 ...	Athos, between Kapsokalývia and Lavra	w H d H 4.0-4.5	30	All w H d H 4.0
K.1499 ...	Athos, Kapsokalývia	w H d H 3.5-4.0	210	All w H d H 3.5-4.0
K.1500 ...	Athos, Dochiariou...	w H d H 3.75	100	All w H d H 3.5-3.75
K.1501 ...	Athos, above Lavra	w H d H 3.5-4.0	150	All w H d H 3.5-4.0
K.1502 ...	Athos, Zographu ...	w H d H 4.0	6	All w H d H 3.5-4.0 (few good fruits set).
K.1503 ...	Athos, Zographu ...	w H d H 3.5-4.0	50	All w H d H 3.5-4.0
K.1504 ...	Athos, Zographu ...	w H d H 3.5-4.0	25	All w H d H 3.5-4.0
K.1505 ...	Athos, Zographu ...	w H d H 3.0-3.5	18	All w H d H 3.0-3.5
K.1569 ...	N. of Salonika, Asbestochori Cemetery	w H d G 3.0-3.5	320	All w H d G 3.0-3.5
K.1570 ...	N. of Salonika, Asbestochori Cemetery	w H d H 3.0-3.5	50	All w H d H 3.0-3.5

The above table shows clearly that in *Clypeola Jonthlaspi* fruit indumentum and fruit size are characters with a genetic basis. Our use of them as intra-specific varietal characters is, therefore, so far justified. More, however, can be stated as a result of the cultural experiments. In several of the original plants the fruit-shape was slightly different from the commoner (in our material) orbicular-elliptic. Thus in K.1503 the fruits were almost or quite orbicular, and the fruits of the offspring had the same shape. In K.1505 the original fruits were obovate and in the offspring the fruits were uniformly of the same shape. This suggests that intraspecific subdivision on genetical fruit characters could be carried even further than was done in the paper quoted above.

The statements made with regard to a high degree of correlation between fruit size and the size of the plant as a whole and to fluctuation in leaf-size and shape have also been confirmed.

Distribution (of species): Mediterranean Region; Mediterranean and Transitional districts of the Balkan Peninsula.

Crambe hispanica L. Sp. Pl. 671 (1753).

Simopetra, between the monastery and the arsenal, 13.4.34, no. 2288; Dochiariou, 18.4.34, near the coast not far from the monastery, no. 2508.

Petals white.

Distribution: Mediterranean Region; Greece, Thessaly, Corfu, Dalmatia.

Erophila verna (L.) E. Meyer sensu O. E. Schulz in Pflanzenr. iv. 105, 345 (1927) var.

Lembet Cemetery, near Salonika, 11.4.34, no. 2585; Asbestochori Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2586.

Distribution (of species): N. Temperate Region; general in the Balkan Peninsula.

The specimens seem related to both var. *majuscula* (Jord.) Hausskn. and var. *acrocarpa* (Brenner) O. E. Sch.

Erysimum crepidifolium Reichb. Pl. Crit. 1, 8, t. 6 f. 13 (1823).

Dionysiou, 18.4.34, rocks above the monastery, no. 2507. Flowers yellow.

Distribution: Central European; N. Macedonia, Thrace, N. Bulgaria, Serbia, Hercegovina.

The leaves are more entire than usual in this species. The endemic *E. calycinum* Griseb. differs in having all the hairs on the leaves bifid and the fruiting pedicels shorter.

Hesperis glutinosa Vis. in Flora 12, Ergänzt. 1, 16 (1829). var. **Visianii** (Fourn.) Hayek Prodr. 1, 417 (1925).

Above Simopetra arsenal, 13.4.34, stony places, no. 2369, pale yellow petals; high above Lavra, 830 m., on slopes of Athos peak, 20.4.34, no. 2525, petals greenish to purplish brown.

Distribution (of species): Italy, S. Macedonia, Bulgaria, Hercegovina, Dalmatia, Croatia, Istria.

Isatis athoa Boiss. Flor. Or. Suppl. 64 (1888) e descr.

Mt. Athos (Panaghia), 12.7.34, 1540 m., waste stony places among rocks, H. G. Tedd, no. 1518.

Flowers yellow, flowering mostly finished.

Distribution: Athos Peninsula (endemic).

This agrees well with the original description except that the pedicels are shorter than the fruits.

Hayek, Prodr. 1, 412 (1925), gives the reference "I. tinctoria var. a." Griseb. Spic. 1, 286. The name *I. tinctoria* var. *athoa* has not been traced, but the name *I. tinctoria* L. var. *stenocarpa* is given with a description by Grisebach. Boissier's type was collected on Athos by Pichler.

I. praecox Kit. in Tratt. Arch. 1, 40, t. 68 (1812).

High above Lavra, 830 m., slopes of Athos peak, 20.4.34, open limestone rocks above the *Abies* zone, no. 2523.

Distribution: Dacian and Pannonian; S. Macedonia, N. and S. Bulgaria, Serbia.

The specimens are young and the identification is somewhat uncertain.

Lepidium spinosum Ard. Anim. Spec. xxxiv., t. 16 (1759).

Near Xerxes Canal, 17.4.34, in cultivated fields, no. 2444.

Plants very rigid and erect.

Distribution: Oriental; Crete, Greece, Cyclades, S. Macedonia, Thrace, Thracian Islands, S. Bulgaria.

Lunaria annua L. Sp. Pl. 653 (1753), subsp. **pachyrhiza** (Borb.) Hayek Prodr. 1, 424 (1925).

Below Zographu Monastery, 16.4.34, shady brushwood at foot of cliff in macchia zone, no. 2432.

Distribution: Central European; general in the Balkan Peninsula, except Crete, Cyclades, Thessaly, Epirus, S. Bulgaria, and S. Croatia.

Malcomia flexuosa S. et S. Flor. Graec. 7, 33, t. 634 (1830).

Simopetra, between the arsenal and the monastery, 13.4.34, stony open places in macchia, No. 2299, dark mauve petals; east of Kapsokalývia, 19.4.34, dry limestone (marble) slopes above the sea, no. 2480; flowers white, turning pale mauve with age; Mulyani Islands, small islet off Pyrgos, in dry open places on scree and in rock clefts, coll. *H. G. Chick*, no. 2639; grown in the Herbarium Ground, Kew, from seed collected on the small islet of the Mulyani Islands, opposite Pyrgos, 14.6.34, *Mrs. Loch*, as K. 1493 and K. 1494.

Distribution: E. Mediterranean Basin; Crete, Greece, Cyclades, Epirus, Albania, Athos Peninsula, Thrace.

Matthiola incana (L.) R. Br. in Ait. Hort. Kew. ed. 2, 4, 119 (1812).

Athos Peninsula, brought by the local postman to Pyrgos, 15.4.34, no. 2403, and cultivated from seeds, from near Chilandari, 22.4.34, in the Herbarium Ground, Kew, 1935–36, as K.1472.

Distribution: essentially Mediterranean Basin and Western Europe; most of the Mediterranean districts of the Balkan Peninsula.

M. sinuata (L.) R. Br. in Ait. Hort. Kew. ed. 2, 4, 120 (1812) subsp. *glandulosa* (Vis.) Vierh. in Verh. zool.—bot. Ges. Wien, 64, 254 (1914).

Mulyani Islands: the smallest island off Pyrgos, 9.4.34, rock clefts and scree, coll. *H. G. Chick*, no. 2612.

Plants grown from seeds in the Herbarium Ground, Kew, from the same source, grew well till the late winter (1935–36) when all were killed by the (not very severe) winter frosts. The Athos plant is less hardy in the open at Kew than is *M. incana* from Athos.

Distribution: essentially Mediterranean Basin; many Mediterranean districts of the Balkan Peninsula.

Nasturtium officinale R. Br. in Ait. Hort. Kew. ed. 2, 4, 110 (1812).

East of Pyrgos, 15.4.34, damp ground in ravine, coll. *H. C. Chick*, no. 2603.

Distribution: N. Temperate Region; general in the Balkan Peninsula.

Thlaspi perfoliatum L. Sp. Pl. 646 (1753).

Mikra Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2665; grown in the Herbarium Ground, Kew, 26.6.35, as K.1447, from seeds collected near Kapsokalývia, 19.4.34.

Distribution: General European and Mediterranean Basin east to the Caucasus; general in the Balkan Peninsula.

CISTACEAE.

Cistus monspeliensis L. Sp. Pl. 524 (1753).

Near Pyrgos, abundant in depauperated macchia, 17.4.34, in dry treeless brushwood, no. 2459.

Leaves very odorous; rather small white flowers.

Distribution: Mediterranean Basin; Greece, Cyclades, Corfu, Albania, Athos, Dalmatia, Istria.

C. salviifolius L. Sp. Pl. 524 (1753).

Mulyani Islands: Pontiko Island, 15.4.34, no. 2399; also from the same islands, 13.4.34, coll. *H. G. Chick*, no. 2640.

Flowers fairly large, petals white.

Distribution: Mediterranean Basin east to Caucasus; most Mediterranean and Transitional districts of the Balkan Peninsula.

C. villosus L. Sp. Pl. ed. 2, 736 (1762), as *C. pilosus*, see Gen. Plant. ed. 6, pag. ult. (1764) subsp. *creticus* (L.) Hayek Prodr. 1, 489 (1925).

Mulyani Islands: second small island off Pyrgos, 15.4.34, coll. *H. G. Chick*, no. 2402.

Petals pink.

Distribution: Mediterranean Basin east to the Caucasus; most Mediterranean and Transitional districts of the Balkan Peninsula.

***Fumana thymifolia* (L.) Verl. var. *glutinosa* (L.) Burn.** Flor. Alp. Mar. 1, 164 (1892).

Near Dochiariou, 18.4.35, stony macchia slopes, no. 2505; near Pyrgos, 25.4.34, dry stony ground, no. 2766.

Flowers small, petals yellow.

Distribution: Mediterranean Basin; most Mediterranean and Transitional districts of the Balkan Peninsula.

***Helianthemum nitidum* Clem.** sensu Hayek Prodr. 1, 495 (1925) var. ***glabrum* (Koch)** cp. Janchen in Oesterr. Bot. Zeitschr. 58, 395-6 (1908).

Athos peak, 1840 m., 12.7.34, rocky places, *H. G. Tedd*, no. 1519.

Distribution (of species): Central European and Caucasus; Albania, N. Macedonia, Montenegro, Bosnia, Hercegovina, Dalmatia, S. Croatia.

***H. nummularium* (L.) Mill.** Dict. ed. 8 (1768).

Bushy slopes above the Roumanian Prodrumus Skete, 19.4.34, dry slopes in macchia, not on limestone, no. 2496.

Distribution: General European and Mediterranean Region; general in the Balkan Peninsula.

The subspecies and varieties of this species (as accepted by Hayek, Prodr. 1, 493-4: 1925) badly need revision.

***Tuberaria guttata* (L.) Fourr.** in Ann. Soc. Linn. Lyons N.S. 16, 340 (1868). ***Helianthemum guttatum* Mill.** Gard. Dict. ed. 8 (1768).

Near Pyrgos, 17.4.34, sandy slopes in depauperated macchie, no. 2461, petals unspotted; Mulyani Islands: small island opposite Pyrgos, 13.4.34, coll. *H. G. Chick*, no. 2609; Longos (Sithonia) Peninsula, 19.4.34, coll. *H. G. Chick* and *H. G. Tedd*, no. 2649, yellow petals with basal blotch.

Distribution: Mediterranean Basin; widespread in the Balkan Peninsula, especially in the Mediterranean and Transitional districts.

Nos. 2461 and 2609 are to be placed with the var. *plantaginea* (Willd.) Grosser in Pflanzenr. iv. 193, 57 (1903). One piece on the sheet of no. 2649 is considered to belong to the "forma" *viscoso-puberula* (Willk.) Vierh. in Oesterr. Bot. Zeitschr. 64, 471 (1914).

VIOLACEAE.

***Viola alba* Bess.** Prim. Flor. Galic. 1, 171 (1809) subsp. ***scotophylla* W. Becker** in Ber. Bayr. Bot. Ges. 8, 2, 257 (1902) var. ***violacea* Wiesb.** in Deutsch. bot. Monat. 3, 45 (1885).

On hills above Karyes, 13.4.34, shady places in woods, no. 2319.

Very sweet-scented indeed, of powerful *V. odorata* odour; soboles present; petals of deep violet colour all over; spur hooked and of deep colour.

Distribution (of species): Central Europe and Mediterranean Region; widespread in the Balkan Peninsula, but not Crete.

***V. athois* W. Becker** in Bull. Herb. Boiss. sér. 2, 2, 854 (1902).

Between Simopetra and Karyes, about 700 m., 13.4.34, in woods, grassy places, and brushwood, in half-shade, no. 2330, small plants with the lower leaves with more orbicular-ovate laminae than usual; Athos peak, 12.7.34, from 150-1970 m., among rocks, *H. G. Tedd* no. 1499, corolla violet-blue, with fragrant odour; grown in the Herbarium Ground, Kew, 20.8.35, etc. (flowers and fruits), as K. 1532, from seed collected, by *H. G. Tedd*, on Athos peak.

Distribution: S. Macedonia and Athos Peninsula.

***V. kitaibeliana* R. et S.** Syst. 5, 383 (1819).

Mulyani Islands, 15.4.34, amongst grass and brushwood, nos. 2397, 2398.

Pale yellow upper petals, dark yellow lower petals.

Distribution : South Europe, E. Mediterranean east to Caucasus ; widespread in the Balkan Peninsula, but not Crete.

V. Riviniana *Reichb.* Pl. Crit. 1, 81, f. 202-208 (1823).

Between Simopetra and Karyes, about 460 m., 13.4.34, in semi-shady places, no. 2327.

Pale violet-coloured corollas with yellow spur.

Distribution : General European ; central and northern districts of the Balkan Peninsula.

CARYOPHYLLACEAE.

Agrostemma Githago *L.* Sp. Pl. 435 (1753).

Hills behind Pyrgos, 6.6.34, *Mrs. Loch* no. 14.

Distribution : E. N. Temperate Region ; general in the Balkan Peninsula.

Arenaria leptoclados (*Reichb.*) *Guss.* Flor. Sic. Syn. 2, 824 (1844) var. **viscidula** (*Rouy et Fouc.*) *Williams* in Journ. Linn. Soc. 33, 368 (1898).

Near Karyes, 13.4.34, on grassy bank, no. 2374 ; Chalkidike Peninsula, head of Cassandra Gulf, 12.4.34, no. 2629 ; Asbestochori Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2661 ; Mikra Cemetery, north of Salonika, 11.4.34, dry stony ground, nos. 2666, 2667.

Distribution (of species) : E. N. Temperate Region ; widespread in the Balkan Peninsula.

A. rotundifolia *M. Bieb.* Flor. Taur.-Cauc. 1, 343 (1808) var. **pauciflora** *Boiss.* Flor. Or. 1, 700 (1867).

Athos peak, 12.7.34, 1970 m., rocks and stony places, *H. G. Tedd* no. 1503.

A sprawling plant with white petals.

Distribution (of species) : Pannonian, Oriental, Caucasian ; Thessaly, Albania, N. and S. Macedonia, Thracian Islands, N. Bulgaria, Rodepe Massif, Serbia, Montenegro.

A. serpyllifolia *L.* Sp. Pl. 423 (1753) var. **viscida** *DC.* Flor. Fr. 6, 611 (1815).

Near Karyes, 13.4.34, on grassy bank, no. 2374.

Distribution : now more or less cosmopolitan ; widespread in the Balkan Peninsula.

The variations and relationships of *A. leptoclados* *Guss.* and *A. serpyllifolia* *L.* require full investigation.

Cerastium banaticum (*Roch.*) *Heuff.* in Verh. zool.-bot. Ges. 8, 77 (1858).

Athos peak, 1480 m., 12.7.34, rock crevices, *H. G. Tedd* no. 1501. Growing in tufts ; white petals.

Distribution : Balkan Peninsular type ; N. and S. Macedonia, Athos, Thrace, Thracian Islands, N. and S. Bulgaria, Rodepe Massif, Serbia.

C. brachypetalum *Desp.* in Pers. Syn. 1, 520 (1805) var. **eglandulosum** *Fenzl* in Ledeb. Flor. Ross. 1, 404 (1842).

Near Karyes, 13.4.34, on grassy bank, no. 2376.

Distribution : Central European, Mediterranean Region, Caucasus ; general in the Balkan Peninsula.

C. glutinosum *Fr.* Nov. Flor. Suec. ed. 2, 132 (1828) subsp. **obscurum** (*Chaub.*) *Schinz et Kell.* sensu Hayek Prodr. 1, 211 (1924).

Asbestochori Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2660.

Distribution : General European and Mediterranean Region ; widespread in the Balkan Peninsula.

C. illyricum *Arđ.* Animadv. 2, 26 (1764).

Mulyani Islands : small island opposite Pyrgos, 15.4.34, dry stony places, no. 2381 ; grown from seed, collected on the same island, 15.4.34, in the Herbarium Ground, Kew, 20.6.35 (flowers) and 13.7.35 (fruits), as K.1457.

Distribution : Oriental or Balkan Peninsular type ; most Mediterranean and Transitional districts of the Balkan Peninsula.

If one follows the account of Bornmüller, in Fedde Repert. **25, 35, 36** (1928), this should probably be called subsp. *pilosum* (S. et S.) Bornm., vix Aschers. et Graebn. Syn. **5, i, 685** (1917). The published accounts, however, are very confused. Plants with intermediate characters and character combinations occur in the same collections and probably many of the characters relied upon are merely fluctuations due to very local habitat conditions.

C. semidecandrum L. Sp. Pl. 438 (1753).

Grown in the Herbarium Ground, Kew, from seeds collected between Pyrgos and Xerxes Canal, 17.4.34, in flower and fruit at Kew, 13.7.35, as K.1450.

Distribution: Central European, Mediterranean Basin, east to Caucasus; most districts of the Balkan Peninsula, but not Thessaly and Epirus.

The flowers and fruits are small and the plants are not altogether typical.

C. glomeratum Thuill. Flor. Par. ed. 2, 226 (1799). *C. viscosum* L. Sp. Pl. 437 (1753).

Near Karyes, 13.4.34, on grassy bank, no. 2375; Mulyani Islands, 15.4.34, stony grassy places, no. 2380; cultivated in the Herbarium Ground, Kew, 20.6.35 and 19.7.34, from seed collected on the hills behind Pyrgos, 25.4.34, as K.1448.

Distribution: now more or less cosmopolitan; general in the Balkan Peninsula.

Dianthus athous Rech. fil. in Fedde Rep. **31, 159/623** (1932).

Athos peak, 1700 m., 12.7.34, rocky places, H. G. Tedd no. 1524.

Distribution: endemic to Athos Peninsula.

Holosteum umbellatum L. Sp. Pl. 88 (1753) var. *glandulosum* Vis. Stirp. Dalm. 37 (1826).

Grown in the Herbarium Ground, Kew, as K.1449, 20.6.35, from seeds collected near Stavronikita, 21.4.34; Asbestochori Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2580.

Distribution (of species): E. N. Temperate Region; general in the Balkan Peninsula.

H. umbellatum L. var. *hirsutum* Turill, var. nov.

Herba a basi multo ramosa, caulibus diffusis inferne glabris superne plus minusve dense glandulosis. *Folia* inferiora late spathulato-oblongeolata, usque ad 2-3 cm. longa et 7 mm. lata, superiora latissime ovata vel elliptica vel fere orbicularia, omnia plus minusve glanduloso-ciliata et in pagina superiore hirsuta. *Sepala* 4-5 mm. longa (in fructu 5-6 mm. longa), glabra. *Petala* usque ad 4-5 mm. longa, glabra, eciliata, apice irregulariter crenulato-dentata. *Stamina* 10.

Mulyani Islands: small second island off Pyrgos, 15.4.34, on rocks near the sea, no. 2405.

This is an interesting variety. The plants have the stems much branched from the base, relatively large leaves which are hairy on the upper surface and broader than in other varieties. The upper cauline leaves are shorter and relatively broader, being broadly ovate to nearly orbicular.

H. umbellatum is a very polymorphic species. Ascherson and Graebner (Synop. **5, i.**, 515 seq.: 1916) record a considerable number of varieties and forms. Material (including the var. *glandulosum* and the species or variety *H. glutinosum* F. et M.) grown at Kew under a range of conditions has shown considerable plasticity. Gay (Ann. Sci. Nat. Sér. 3, **4**, 23: 1845) united *H. glutinosum* F. et M. and *H. tenerrimum* Boiss. with *H. umbellatum* as varieties. There is evidence at Kew in favour of this, since a large series of specimens shows almost continuous variation from Western European, relatively glabrous, *H. umbellatum*, to densely glandular Caucasian or Persian *H. glutinosum*, though no European material has been seen which matches the extreme eastern *H. glutinosum*. The number of stamens is also a variable character, but the number is usually higher in eastern than in western

material. In some characters the plant here described as *H. umbellatum* var. *hirsutum* is intermediate between *H. umbellatum* s. s. and *H. glutinosum*.

Kohlrauschia velutina (Guss.) Reichb. Icon. 6, 43 (1844).

Above Simopetra, 13.4.34 stony ground, no. 2337; near Lavra, 19.4.34, dry stony ground, no. 2469.

Distribution: Mediterranean Region; fairly widespread in the Balkan Peninsula.

Minuartia tenuifolia (L.) Hiern in Journ. Bot. 37, 321 (1899) subsp. **hybrida** (Vill.) Mattf. in Engl. Bot. Jahrb. 57, Beibl. 126, 29 (1921).

Above the Roumanian Prodomos Skete, near Athos point, 19.4.34, stony slopes in the macchia, not on limestone, no. 2499; near Chilandari, 22.4.34, on walls, no. 2673; grown in the Herbarium Ground, Kew, 19.7.34, as K.1467 from seeds collected near Chilandari, 22.4.34.

Distribution (of species): Central Europe and Mediterranean Region; fairly widespread in the Balkan Peninsula.

The specimens show an interesting range in the degree of development of the glandular pubescence on the calyx.

M. verna (L.) Hiern in Journ. Bot. 37, 320 (1899) subsp. **Gerardii** (Willd.) Graebn., var. **mediterranea** (Fz.) Graebn., in Asch. et Graebn. Synop. Flor. Mitt.-Eur. 5, i. 746 (1918). See also Hayek, Prodr. 1, 186 (1924) and Halácsy in Herb. Kew.

Athos peak, 12.7.34, 1960 m., rock crevices, *H. G. Tedd* 1502.

Petals white.

Distribution (of species): E. N. Temperate Region; widespread in the Balkan Peninsula.

Moenchia erecta (L.) Gaertn. Mey. et Scherb. Flor. Wett. 1, 219 (1799).

One hour's climb above Chilandari, 23.4.34, fruiting material collected as K.1452.

Distribution: Central Europe and Mediterranean Region; Athos, Thrace, S. Bulgaria, Dalmatia, Istria.

M. mantica (Torn.) Bartl. Cat. sem. hort. Gött. 1839, 5, ex. Koch Syn. Flor. Germ. ed 2, 131 (1843).

Hills behind Pyrgos, 11.6.34, *Mrs Lock* no. 2; near Pyrgos, 24.4.34, stony ground, no. 2746.

Distribution: Mediterranean Region; most districts of the Balkan Peninsula, but not Crete.

Polycarpon tetraphyllum L. Syst. ed. 10, 881 (1759) var. **diphyllum** (Cav.) DC. Prodr. 3, 376 (1828).

Mulyani Islands: Pontiko Island, 15.4.34 dry stony places, no. 2388.

Distribution: Old World; most districts of the Balkan Peninsula.

Silene colorata Poir. Voy. Barb. 2, 163 (1789).

Mulyani Islands: second small island off Pyrgos, 15.4.34, dry stony places, no. 2389, and, collected *H. G. Chick*, 13.4.34, no. 2579; hill behind Pyrgos, 11.4.34, collected *H. G. Chick*, no. 2614.

Distribution: Mediterranean Basin; Crete, Greece, Cyclades, Corfu, Albania, Thrace.

S. Cucubalus Wib. Prim. Flor. Werth. 241 (1799).

Near Simopetra, 13.4.34, dry banks and stony ground, no. 2361, a rather tall loose form with straggling branches; Athos peak, 12.7.34, 1960 m., rocky and stony places near summit of peak, *H. G. Tedd* no. 1493, a few-flowered variety or form with pigment in calyx, nearly white petals, and purple anthers.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

Silene Fabaria S. et S. Prodr. 1, 293 (1806) et Flor. Graec. t. 415 (1825).

Mulyani Islands: Frying Pan Island, 5.6.34, *Mrs. Lock* no. 19; near Kapsokalyvia, 19.4.34, dry limestone slopes, no. 2492; grown in the

Herbarium Ground, Kew, 21.9.35, as K. 1473, from seed collected south-east of the wall of the Holy Ground, 24.4.34.

Distribution: E. Mediterranean Basin; Greece, S. Macedonia, Athos Peninsula, Thrace.

Cucubalus Fabarius L. Sp. Pl. 414 (1753) is said to be from Sicily and, since *S. Fabaria* S. et S. (description and plate) is not recorded from Sicily, may be a variety of *S. Cucubalus* Wib. (see Fiori, Nuovo Flor. Anal. d'Ital. 485: 1924). If this be so the nomenclatural validity of the name *Silene Fabaria* comes into question. There is, however, no doubt of Sibthorp and Smith's botanical intention of denoting the species to which the name *S. Fabaria* is generally given and their name is therefore retained here.

S. gallica L. Sp. Pl. 417 (1753).

Hills behind Pyrgos, 6.34, *Mrs Loch* no. 23; Mulyani Islands: second small island off Pyrgos, 15.4.34, dry stony places, no. 2389; near Xerxes Canal, 17.4.34, cultivated fields, no. 2443.

Petals pink.

Distribution: now more or less cosmopolitan; widely spread in the Balkan Peninsula.

S. genistifolia Hal. in Oesterr. Bot. Zeitschr. 42, 369 (1892).

Athos peak, 12.7.34, 1700 m., among rocks, *H. G. Tedd* no. 1489.

Stems slender with sticky excretion; petals white.

Distribution: probably endemic to Athos.

The original description of Halácsy is apparently inaccurate in giving the calyx length as 10–12 mm. Hayek's measurements of 18 to 23 mm. agrees with the material collected by Sintenis and Bornmüller, as well as with Tedd's specimens, but whether Hayek is correct in combining *S. genistifolia* Hal. with *S. macropoda* Vel. var. *media* Vel. in K. böhm. Ges. Wiss. Prag 1902, 3 (separ.), from Belogradčik and Kostenec in Rila, Bulgaria, is uncertain.

S. italica (L.) Pers. Syn. 1, 498 (1805).

Above Simopetra, 13.4.34, in brushwood, no. 2344; ravine in hills behind Pyrgos, 15.4.34, coll. *H. G. Chick*, no. 2652; south-east of Pyrgos, 24.4.34, no. 2714, flowers attacked by *Ustilago*.

Petals white.

Distribution: Central Europe, Mediterranean Region, Caucasus; general in the Balkan Peninsula.

Spergula arvensis L. Sp. Pl. 440 (1753) var. *laricina* (Wulf) Aschers. Flor. Brand. 1, 93 (1864).

Between Pyrgos and Xerxes Canal, 17.4.34, sandy ground near shore, no. 2453.

Semi-prostrate, much branched from the base, whole plant glandular-pilose. There are only 6 to 7 stamens per flower and in some respects the plants verge towards *S. pentandra* L.

Distribution (of species): more or less cosmopolitan; widespread in the Balkan Peninsula.

Spergularia rubra (L.) Pers. Syn. 1, 504 (1805).

Panteleemon, 14.4.34, between stones near the sea-shore, no. 2262.

Distribution: E. N. Temperate Region; widespread in the Balkan Peninsula.

S. salina J. et C. Presl Flor. Čech. 95 (1819).

Panteleemon, 14.4.34, between stones near the sea-shore, no. 2261.

Distribution: now nearly cosmopolitan in temperate coastal regions; most coastal districts in the Balkan Peninsula.

Stellaria media (L.) Vill. Hist. Pl. Dauph. 3, 615 (1789).

Between Panteleemon and Karyes, 630 m., 14.4.34, damp places in *Castanea* wood, no. 2267, a plant with rather tall stems and large flowers with 3 to 4 stamens; between Simopetra and Karyes, 460 m., 13.4.34, in partial shade

of woods, no. 2331, a plant with the lower leaves long stalked and the stems, the upper leaves, and the sepals densely glandular hairy; either the var. *pubescens* Post Flor. Syr. 154 (1896) or approximating to this.

Distribution (of species): cosmopolitan; general in the Balkan Peninsula.

PORTULACACEAE.

Montia verna Neck. Del. Gallo-Belg. 1, 78 (1768).

High above Simopetra, on the way to Karyes, 610 m., 13.4.34, in a small stream, no. 2318.

Distribution: N. Temperate Region; widespread in the Balkan Peninsula.

TAMARICACEAE.

Tamarix tetrandra Pall. in M. Bieb. Flor. Taur.-Cauc. 1, 247 (1808).

Near Chilandari Arsenal, 22.4.34, in dry stream bed, no. 2684.

Very pale pink flowers.

Distribution: Oriental; Crete, Greece, S. Macedonia, Thrace, S. Bulgaria.

HYPERICACEAE.

Hypericum Montbretii Spach Hist. Nat. Veg. 5, 395 (1836).

Simopetra, between the monastery and the arsenal, 13.4.34, dry stony ground, no. 2355.

Distribution: Balkan Peninsular type, east to Caucasus; N. and S. Macedonia, Athos, Thrace, N. and S. Bulgaria, Rodope Massif.

H. olympicum L. Sp. Pl. 784 (1753).

Mulyani Islands: Pontiko Island, 20.6.34, Mrs. Loch no. 34; Athos peak, 1540 m., H. G. Tedd no. 1521.

Distribution: E. Mediterranean Basin, east to Caucasus; Greece, Thesaly, N. and S. Macedonia, Athos Peninsula, Thrace, Thracian Islands, N. and S. Bulgaria, Rodope Massif.

H. perforatum L. Sp. Pl. 785 (1753) verging to var. *angustifolium* DC. Flor. Fr. 5 (6), 630 (1815).

Pyrgos, 8.34, Mrs. Loch no. 30. A slender few-flowered form, possibly growing in the shade.

Distribution: E. N. Temperate Region; most districts of the Balkan Peninsula.

H. rhodopeum Friv. in Flora 19, 436 (1836).

High above Karyes, 13.4.34, more or less open spaces in shady woods, no. 2310; above Simopetra, 13.4.34, stony, more or less open places in macchia, no. 2326.

Glaucous leaves; large yellow flowers.

Distribution: Balkan Peninsular type extending to N. Asia Minor; N. and S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif.

LINACEAE.

Linum angustifolium Huds. Flor. Angl. ed. 2, 1, 134 (1778).

Near Kapsokalyvia, 19.4.34, dry limestone slopes, no. 2476; Mulyani Islands: on small island opposite Pyrgos, 13.4.34, coll. H. G. Chick, nos. 2597, 2610.

Distribution: W. Europe, Mediterranean Basin east to Caucasus, general in the Balkan Peninsula.

L. austriacum L. Sp. Pl. 278 (1753) subsp. *eu-austriacum* Hayek, Prodr. 1, 566 (1925).

Athos peak, 1630–1970 m., 12.7.34, rocky places, H. G. Tedd no. 1497.

Petals bright azure blue.

Distribution: Pannonian and Mediterranean Regional, east to Caucasus; general in the Balkan Peninsula.

L. elegans *Sprun.* in Boiss. Diagn. 2, 1, 99 (1854).

East of Kapsokalyvia, 19.4.34, on crystalline limestone rock scree, on dry slopes above the sea, no. 2491.

Petals bright yellow.

Distribution : Balkan Peninsular type extending to N.W. Asia Minor ; Mediterranean districts of the Balkan Peninsula.

L. tenuifolium *L.* Sp. Pl. 278 (1753).

Athos peak, 1700–1970 m., 12.7.34, among rocks, *H. G. Tedd* no. 1496.

Petals light pink.

Distribution : Mediterranean Basin, east to Caucasus ; most districts of the Balkan Peninsula, but not Crete.

GERANIACEAE.

Erodium Botrys (*Cav.*) *Bertol.* *Amoen. Ital.* 35 (1819).

Mulyani Islands : small island off Pyrgos, 13.4.36, no. 2635.

Petals purplish.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, Corfu, S. Macedonia, Thrace.

E. ciconium (*Just.*) *Willd.* Sp. Pl. 3, 629 (1801).

Cultivated, as K. 1480, in the Herbarium Ground, Kew, 20.6.35, 5.7.35, 13.7.35, from seeds collected on the Mulyani Islands : Pontiko Island, 25.4.34.

Distribution : Mediterranean Basin, east to Caucasus ; most districts of the Balkan Peninsula, but not Crete.

E. romanum (*L.*) *L'Hér.* in *Ait. Hort. Kew.* ed. 1, 2, 414 (1789).

Between Pyrgos and Xerxes Canal, 17.4.34, on dry bare ground, no. 2448.

Sepals reticulately veined in the upper half, petals pale pink, pits of carpels with glands.

Distribution : Mediterranean Basin ; Greece, Cyclades, Thrace.

Geranium columbinum *L.* Sp. Pl. 682 (1753) var. *holopetalum* *Griseb.* Spic. 1, 123 (1843).

Plateau between Chilandari and Pyrgos, 23.4.34, open places in macchie with *Pinus halepensis*, no. 2694.

Distribution (of species) : E. N. Temperate Region ; general in the Balkan Peninsula.

G. lucidum *L.* Sp. Pl. 682 (1753).

High above Lavra, on the slopes of Athos peak, 770 m., 20.4.34, in stony shady places in *Abies* zone, no. 2517.

Distribution : E. N. Temperate Region ; general in the Balkan Peninsula.

G. molle *L.* Sp. Pl. 682 (1753).

South-east of Pyrgos, 24.4.34, on bare ground, no. 2716.

Distribution : E. N. Temperate Region ; general in the Balkan Peninsula.

G. purpureum *Vill.* Hist. Pl. Dauph. 3, 374, t. 40 (1789).

Near Simopetra, 13.4.34, grassy places, no. 2371.

Distribution : W. and parts of Central Europe, Mediterranean Region, Caucasus ; Mediterranean and Transitional districts of the Balkan Peninsula.

G. Robertianum *L.* Sp. Pl. 681 (1753).

High above Lavra, on slopes of Athos Peak, 770 m., 20.4.34, stony ground in *Abies* forest, no. 2518 ; between Stavronikita and Pantokratoros, 21.4.34, damp spots in macchie, on mica-schist slopes, no. 2556.

Distribution : Central Europe, Mediterranean Region, Caucasus ; wide-spread in the Balkan Peninsula, but not in Crete.

G. rotundifolium *L.* Sp. Pl. 683 (1753).

Mulyani Islands : small island off Pyrgos, 13.4.34, no. 2638.

Distribution : E. N. Temperate Region ; general in the Balkan Peninsula.

RHAMNACEAE.

Paliurus spina-Christi *Mill. Gard. Dict. ed. 8* (1768).

Seedlings grown as K. 1471 in the Herbarium Ground, Kew, 19.7.35, from seeds collected between Pyrgos and Xerxes Canal, 17.4.34.

Distribution : Mediterranean Region, N. to Hungary and S. Tyrol and east to Caucasus ; general in the Balkan Peninsula, but not in Crete.

Rhamnus Alaternus *L. Sp. Pl. 193* (1753).

Simopetra, between the monastery and the arsenal, 13.4.34, in tall macchia, no. 2297 ; above Simopetra, 13.4.34, in macchia, no. 2333, small greenish flowers ; above Zographu Arsenal, 16.4.34, in high macchia, no. 2409 ; south-east of Pyrgos, 24.4.34, *Cistus*-clad slopes above the sea, no. 2740, bushy shrub with reddish fruits.

Distribution : Mediterranean Basin ; most Mediterranean districts of the Balkan Peninsula.

ACERACEAE.

Acer platanoides *L. Sp. Pl. 1055* (1753).

High above Lavra on slopes of Athos peak, 830 m., 20.4.34, in high forest, groups of deciduous trees in *Abies* forest, no. 2529.

Distribution : Central Europe and E. Mediterranean Basin east to Caucasus ; most districts of the Balkan Peninsula, but not Crete.

ANACARDIACEAE.

Pistacia Lentiscus *L. Sp. Pl. 1026* (1753).

Head of Cassandra Gulf, 12.4.34, no. 2608.

Distribution : Mediterranean Basin ; most Mediterranean districts of the Balkan Peninsula.

P. Terebinthus *L. Sp. Pl. 1025* (1753).

Near Stavronikita, in flower 21.4.35, on dry mica-schist slopes, in macchia, no. 2559.

Distribution : Mediterranean Basin ; most Mediterranean districts of the Balkan Peninsula.

LEGUMINOSAE.

Anthyllis Hermanniae *L. Sp. Pl. 720* (1753).

Pyrgos, cliffs, 10.6.34, *Mrs. Loch* no. 12.

Height 9 to 10 inches.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, Epirus, Corfu, Albania, S. Macedonia, Athos Peninsula, Thrace, Thracian Islands, Montenegro.

A. montana *L. Sp. Pl. 719* (1753).

Athos peak, 1940 m., 12.7.34, among rocks, *H. G. Tedd* no. 1517.

Flowers cream-white, becoming brown on withering.

Distribution : Mediterranean Basin ; most Mediterranean and Transitional districts of the Balkan Peninsula, but not in Crete.

A. Vulneraria *L. Sp. Pl. 719* (1753) subsp. **pulchella** (*Vis.*) *Bornm.* sensu Hayek *Prodr.* 1, 888 (1926).

Athos peak, 1900 m., 12.7.34, among rocks near the summit, a few plants only, *H. G. Tedd* no. 1488.

Calyx reddish, corolla nearly white, musty red when withered.

Distribution (of species) : general European and Mediterranean Basin east to Caucasus ; general in the Balkan Peninsula.

Astragalus angustifolius *Lam. Enc. 1, 321* (1784) subsp. **pungens** (*Willd.*) Hayek *Prodr.* 1, 790 (1926). *A. angustifolius* var. *bracteatus* Griseb. *Spic.* 1, 57 (1843).

Athos peak, 1900–1970 m., among rocks, 12.7.34, *H. G. Tedd* no. 1511.

A cushion plant ; the rhachis of the leaves hardens to a spine in the second year.

Distribution : (of species) : Balkan Peninsular type east to Asia Minor ; widely distributed in the Balkan Peninsula.

A. macedonicus Heldr. et Nadji in Nadji, Geogr. Bot. 19 (1892). *A. monspessulanus* L. var. *macedonicus* (Heldr. et Nadji) Hayek, Prodr. 1, 787 (1926).

Below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2423.

Distribution : Balkan Peninsular endemic ; N. and S. Macedonia, S. Bulgaria, Rodope Massif.

A. parnassi Boiss. Diagn. 1, 9, 80 (1849).

Athos peak, 1700 m., 12.7.34, among rocks, *H. G. Tedd* no. 1526.

A cushion plant, rachides of leaves hardening to spines, flowers bright red-pink.

Distribution : Balkan Peninsular endemic ; Greece, Thessaly, Epirus, N. and S. Macedonia, Athos Peninsula, Thracian Islands.

Biserrula pelecinus L. Sp. Pl. 762 (1753).

Mulyani Islands : 15.4.34, damp places in brushwood, no. 2391 ; a lush form with relatively long stems, large green leaves and mauve flowers. A remarkable contrast with no. 2680.

Near Chilandari, 22.4.34, sandy field near the sea, no. 2680 ; a low-growing form, densely hairy, with small leaflets.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, N. and S. Macedonia, Athos Peninsula, Thrace.

Calycotome villosa (Poir.) Link Enum. 2, 225 (1822).

Simopetra, between the monastery and the arsenal, 13.4.34, no. 2285.

Yellow flowers with a sweet scent.

Distribution : Mediterranean Basin ; most Mediterranean districts of the Balkan Peninsula.

Cercis siliquastrum L. Sp. Pl. 374 (1753).

Above Panteleëmon, 14.4.34, in high macchia, no. 2266.

Distribution : Mediterranean Region ; most Mediterranean and Transitional districts of the Balkan Peninsula, but not Crete.

Coronilla cretica L. Sp. Pl. 743 (1753).

Near Kapsokalyvia, 19.4.34, dry macchia slopes, no. 2497.

Flowers pink and few.

Distribution : E. Mediterranean Basin, Caucasus ; most Mediterranean and Transitional districts of the Balkan Peninsula.

C. emeroides Boiss. et Sprun. Diagn. 1, 2, 100 (1843).

Ravine behind and to S.E. of Pyrgos, 14.4.34, coll. *H. G. Chick*, no. 2653.

See Uhrová in Beih. Bot. Centrbl. 53, 47 (1935) where *C. emeroides* is made a subspecies of *C. Emerus* L.

Distribution : Central Europe, Mediterranean Basin, Caucasus ; widespread in the Balkan Peninsula.

Cytisus hirsutus L. Sp. Pl. 739 (1753) s.l. var.

Above Simopetra, 13.4.34, no. 2314.

The petals are yellow and the vexillum is hairy on the back along the middle line.

Distribution : E. N. Temperate Region ; widespread in the Balkan Peninsula, not in Crete.

C. triflorus L. Hér. Stirp. 184 (1784).

Between Simopetra and Karyes, 400 m., 13.4.34, in woods, no. 2324.

Distribution : Mediterranean Basin ; Greece, Thessaly, Corfu, Albania, Athos Peninsula, Thrace.

Dorycnium graecum (L.) Ser. in DC. Prodr. 2, 208 (1825).

Plateau between Chilandari and Pyrgos, 23.4.34, in macchia under *Pinus halepensis*, no. 2693.

White petals.

Distribution : Pontic and Caucasian type ; Greece, Thessaly, S. Macedonia, Athos Peninsula, Thrace, N. Bulgaria.

Genista tinctoria L. Sp. Pl. 710 (1753).

High above Simopetra, 610 m., 13.4.34, in woods, no. 2317 ; Sithonia (Longos) Peninsula, near Armisti, 19.6.34, coll. H. G. Chick and H. G. Tedd, no. 2648.

The lateral nerves of the leaves are inconspicuous and in the absence of fruiting material the identification is not quite certain.

Distribution : General European east to Caucasus ; most districts of the Balkan Peninsula, except the southernmost.

Hymenocarpus circinnatus (L.) Savi Flor. Pis. 2, 205 (1798).

Near Zographu Monastery, 16.4.34, stony places in macchia, no. 2413.

Distribution : Mediterranean Region ; general in the Mediterranean districts of the Balkan Peninsula.

Lathyrus Aphaca L. Sp. Pl. 729 (1753).

Near Xerxes Canal, 17.4.34, in cultivated fields, no. 2433, flowers rather large, petals very pale creamy white ; above the Roumanian Prodomos skete, near the point of the Peninsula, 19.4.35, dry bushy slopes in macchia, not on limestone, no. 2495, flowers rather small, petals bright yellow.

Two markedly distinct varieties. The intraspecific variation of this species requires re-investigation.

Distribution : W. Europe, Mediterranean Region, Caucasus ; general in the Balkan Peninsula.

L. Cicera L. Sp. Pl. 730 (1753).

Head of Cassandra Gulf, Chalkidike Peninsula, 12.4.34, no. 2630.

A more hairy plant than usual in the species, with narrow leaflets.

Distribution : Mediterranean Region, Caucasus ; general in the Balkan Peninsula.

L. digitatus (M. Bieb.) Fiori in Fiori e Paoletti, Flor. Anal. d'Ital. 2, 105 (1899) ; *Orobis digitatus* M. Bieb. Flor. Taur.-Cauc. 2, 153 (1808) ; *O. sessilifolius* S. et S. Prodr. 2, 64 (1813) et Flor. Graec. t. 692 (1830) ; *Lathyrus sessilifolius* (S. et S.) Ten. Flor. Neap. Prodr. App. 5, 20 (1826).

Above Simopetra, 13.4.34, dry stony and bushy ground, no. 2342.

A variety with long narrow leaflets, long inflorescences, and large deep wine-purple flowers. Probably the var. *longiflorus* Čel. in Sitz. k. böhm. Ges. Wiss. Prag. 1887, 528 (under *L. sessilifolius*).

Distribution : E. Mediterranean Basin and Pontic ; southern and eastern districts of the Balkan Peninsula, but not in Crete.

L. sativus L. Sp. Pl. 730 (1753).

S.E. of Pyrgos, in ravine, 15.4.34, coll. H. G. Chick. no. 2607.

Distribution : E.N. Temperate Region ; widespread in the Balkan Peninsula.

L. venetus (Mill.) Wohlf. in Hallier et Wohlf. ed. Koch Syn. ed. 3, 714 (1892) ; *Orobis venetus* Mill. Gard Dict. ed. 8 (1768).

High above Simopetra, on way to Karyes, 14.4.34, semi-shady places in woods, no. 2303.

Purple flowers.

Distribution : Mediterranean Basin ; most districts of the Balkan Peninsula, but not Crete or the Dobruja.

Lotus edulis L. Sp. Pl. 774 (1753).

Above Pyrgos, 25.4.34, on *Cistus*-clad granite slopes, no. 2752.

Corolla pale yellow.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, Corfu, Thrace, Dalmatia.

L. peregrinus L. Sp. Pl. 774 (1753).

South-east of Pyrgos, in ravine, 15.4.34, coll. H. G. Chick, no. 2606.

Distribution : E. Mediterranean Basin ; Crete, Greece, Cyclades, Montenegro.

Lupinus angustifolius L. Sp. Pl. 721 (1753).

Simopetra, between the arsenal and the monastery, 13.4.34, stony open places in macchia, no. 2292; Mulyani Islands: small island opposite Pyrgos, 13.4.34, coll. H. G. Chick, no. 2625.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, N. and S. Macedonia, Thrace.

L. Termis Forsk. Flor. Aeg. 131 (1775).

Near Stavronikita, towards Pantokratoros, 21.4.34, bare ground in olive-groves on mica-schist slopes, no. 2549.

Distribution : E. Mediterranean Basin ; here and there in several districts of the Balkan Peninsula, but often (? always) as an escape from or weed of cultivation.

Medicago hispida Gaertn. De fruct. 2, 349 (1791) var. **denticulata** (Willd.) Urb. App. ind. hort. Berol. 1872, 3.

South of Pyrgos, 24.4.34, bare stony ground, no. 2735.

Distribution (of species) : E.N. Temperate Region ; most districts of the Balkan Peninsula.

M. littoralis Rohde in Lois. Not. 118 (1810) var. **longiseta** DC. Flor. Franc. 5 (6), 568 (1815).

Between Pyrgos and Xerxes Canal, 17.4.34, on blown sand among rocks, no. 2439; south of Pyrgos, 24.4.34, bare sandy ground, no. 2737.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, Corfu, Thrace, Montenegro, Dalmatia, Istria.

M. marina L. Sp. Pl. 779 (1753).

Pyrgos district, towards Xerxes Canal, 17.4.34, sandy sea shore, no. 2455; Mulyani Islands: small island off Pyrgos, 22.4.34, slopes near the sea, no. 2651.

Distribution : Mediterranean Basin, east to Caucasus ; most coastal districts of the Balkan Peninsula.

M. tribuloides Desr. in Lam. Enc. 3, 635 (1791).

South of Pyrgos, 24.4.34, bare sandy ground, no. 2736.

Distribution : Mediterranean Region ; most Mediterranean and Transitional districts of the Balkan Peninsula.

Melilotus neapolitanus Ten. ex Guss. Flor. Sic. Prodr. 2, 482 (1828).

South of Pyrgos, 24.4.34, bare places on sandstone slopes with *Cistus*, etc., no. 2720.

Distribution : Mediterranean Region, Caucasus ; most Mediterranean and Transitional districts of the Balkan Peninsula.

Onobrychis Caput-galli (L.) Lam. Flor. Fr. 2, 651 (1778).

South of Pyrgos, 24.4.34, bare sandy ground near the sea, no. 2731.

Distribution : Mediterranean Basin east to Caucasus ; most Mediterranean and Transitional districts of the Balkan Peninsula.

Ornithopus compressus L. Sp. Pl. 744 (1753).

Above Simopetra, 310 m., 13.4.34, stony ground, no. 2335.

Distribution : Mediterranean Basin, east to Caucasus ; fairly widespread in the Balkan Peninsula.

O. pinnatus (Mill.) Druce in Journ. Bot. 45, 420 (1907).

Mulyani Islands: small island opposite Pyrgos, 13.4.34, coll. H. G. Chick, no. 2634.

Distribution : Mediterranean Basin ; Greece, Cyclades, Athos Peninsula.

Pisum elatius Stev. in M. Bieb. Flor. Taur.-Cauc. 2, 151 (1808).

Simopetra, between the arsenal and the monastery, 13.4.34, dry ground, no. 2353; Mulyani Islands: 15.4.34, in brushwood, no. 2390, standard mauve, keel and wings blackish purple.

Distribution: E. N. Temperate Region; Greece, Corfu, N. and S. Macedonia, Athos Peninsula, N. Bulgaria, Rodope Massif, Serbia, Montenegro, Dalmatia, Istria.

The relationships between *P. arvense* L. and *P. elatius* Stev. require further investigation.

Psoralea bituminosa L. Sp. Pl. 763 (1753) var. **ovata** (Rouy in Rouy et Fouc. Flor. Fr. 5, 131: 1899 as sub-var.).

South of Pyrgos, 24.4.34, bare places on slopes with *Cistus* bushes, facing sea, no. 2717.

Distribution: Mediterranean Region, Caucasus; most Mediterranean and Transitional districts of the Balkan Peninsula.

Trifolium arvense L. Sp. Pl. 769 (1753).

South of Pyrgos, 24.4.34, bare places on *Cistus*-clad slopes facing the sea, no. 2728.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

T. campestre Schreb. in Sturm. Deutschl. Flor. 16 (1804).

South of Pyrgos, 24.4.34, bare stony ground, no. 2715.

Distribution: General European, Mediterranean Basin, east to Caucasus; general in the Balkan Peninsula.

T. dolopi(c)um Heldr. et Hausskn. ap. Gib. et Belli in Malpighia 3, 228 (1889).

Above Chilandari, 23.4.34, in macchia on decomposing granite, no. 2699. Flowers golden-yellow.

Distribution: Thessaly, Thrace.

This species was published, with a description, by Haussknecht (Mitt. Thur. Bot. Ver. N.F. 5, 78: 1893) as *T. patens* Schreb. var. *Koronense*. The material on which this description was based was collected by Haussknecht in Thessaly: "in schistosis pr. mon. Korona." The Athos plants agree well with this description in all characters. Gibelli and Belli (l.c.) suggest that the original material of Heldreich may have resulted from a cross between *T. patens* Schreb. and *T. mesogitanum* Boiss. This is most unlikely and it seems certain that *T. dolopicum* has to be accepted as a good species with a discontinuous distribution in countries around the northern part of the Aegean Sea. It has not improbably arisen mutationally from the more widely distributed *T. patens* Schreb.

Davidoff (in Trud. Balg. Prirod. Drus. 8, 70: 1915, p. 28 of separate) records the species from Western Thrace, in a meadow near Gumaldschina.

There is some difficulty in applying the name *T. dolopicum*. Halácsy, Consp. Flor. Graec. 1, 405 (1900), quotes it as "*T. dolopicum* Heldr. et Hausskn. in Heldr. it. iv. per Thessal. a. 1885." Gibelli and Belli (l.c.) give it as "*T. dolopium* Heldr. et Hochst." Both Halácsy and Gibelli quote Heldreich (not Haussknecht) as the collector of the type material.

T. glomeratum L. Sp. Pl. 770 (1753).

Near Pyrgos, 25.4.34, dry stony ground, no. 2757.

Distribution: W. Europe, Mediterranean Basin east to the Caucasus; widespread in the Balkan Peninsula.

T. nigrescens Viv. Flor. Ital. fragm. 12, t. 13 (1808).

South-east of Pyrgos, 24.4.34, sandy fields by the sea, no. 2730.

Distribution: Mediterranean Basin; most districts of the Balkan Peninsula.

Trifolium radiosum Wahlenb. in Berggr. Resor. Eur. 2, Bih. 43 (1826).

T. nidificum Griseb. Spic. 1, 32 (1843).

South-east of Pyrgos, 24.4.34, bare sandy ground, no. 2732.

Flowers pinkish-cream.

Distribution: E. Mediterranean Basin; Greece, S. Macedonia, Athos Peninsula, Thrace.

T. scabrum L. Sp. Pl. 770 (1753).

South-east of Pyrgos, 24.4.34, bare sandy ground, no. 2733.

Petals pink. The calyx segments are somewhat shorter and broader than the average for the species.

Distribution : W. Europe, Mediterranean Basin east to the Caucasus ; most districts of the Balkan Peninsula.

T. stellatum L. Sp. Pl. 769 (1753).

Near Zographu Monastery, 16.4.34, stony ground at path side, no. 2410.

Distribution : Central Europe, Mediterranean Region ; most Mediterranean and Transitional districts of the Balkan Peninsula.

T. subterraneum L. Sp. Pl. 767 (1753).

Above Simopetra, 13.4.34, dry stony places on banks, no. 2367.

White petals.

Distribution : Central Europe, Mediterranean Region, Caucasus ; general in the Balkan Peninsula.

T. tomentosum L. Sp. Pl. 771 (1753).

South-east of Pyrgos, 24.4.34, bare sandy ground, no. 2734.

Distribution : Mediterranean Region ; most Mediterranean and Transitional districts of the Balkan Peninsula.

T. uniflorum L. Sp. Pl. 771 (1753).

High above Simopetra, 13.4.34, on stony ground, no. 2316.

Corollas white. Plants forming flat cushions.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, S. Macedonia, Athos Peninsula, Thrace, Thracian Islands, Dalmatia.

A variety with pale glabrous calyx-tubes and rather large white petals. In Hayek's Prod. 1, 856 (1926) it comes under var. *cryptoscias* (Griseb.) Gib. et Belli, but the flowers are decidedly larger than those of Grisebach's material at Kew.

Vicia angustifolia Reich. Flor. Moen. Frankf. 2, 44 (1778).

Near Chilandari, 22.4.34, sandy fields near the sea, no. 2682A.

Flowers purple. One of the numerous varieties or forms of this species with the leaflets of the upper leaves long acuminate.

Distribution : General European, Mediterranean Basin east to Caucasus ; most districts of the Balkan Peninsula.

V. Barbazitae Ten. et Guss. Mem. peregr. 1838, 165.

High above Simopetra, on the ridge on the way to Karyes, 13.4.34, no. 2320.

Standards cream, wings violet, keel very short.

Distribution : S. European ; Greece, Thessaly, N. and S. Macedonia, Athos Peninsula, S. Bulgaria.

The above reference has not been seen but the description in Ann. Sci. Nat. sér. 2, 13, 381 (1840) has been consulted.

V. bithynica L. Syst. ed. 10, 1166 (1759).

Near Chilandari, 22.4.34, sandy field near the sea, among bushes, no. 2681.

Standards pale mauve, keel and wings nearly white.

Distribution : Mediterranean Basin east to the Caucasus ; most Mediterranean and Transitional districts of the Balkan Peninsula.

V. dasycarpa Ten. Viagg. Abruzz. 81 (1829) n.v. ; Flor. Nap. 5, 116, t. 244 (1835-36).

Mulyani Islands : small island opposite Pyrgos, 13.4.34, coll. H. G. Chick, no. 2637.

Distribution : Mediterranean Basin ; most districts of the Balkan Peninsula.

There does not seem to be a very sharp line of distinction between *V. villosa* Roth and *V. dasycarpa* Ten. No. 2637 has rather long and relatively narrow leaflets and the calyx characters of *V. dasycarpa*. The leaves and stems are hairy, though not densely so.

V. grandiflora Scop. Flor. Carn. ed. 2, 2, 65, t. 42 (1772). var. **Kitaibeliana** Koch Syn. 197 (1835).

Above Simopetra, 13.4.34, no. 2343.

Pale yellow corollas, turning to a brownish colour with age.

Distribution (of species): Central Europe, Italy, E. Mediterranean Basin east to the Caucasus; widespread in the Balkan Peninsula, but not from Crete.

V. lathyroides L. Sp. Pl. 736 (1753).

Asbestochori Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2588; above Pyrgos, 25.4.34, grassy spot on granitic slopes, no. 2755.

Distribution: General European, Mediterranean Basin east to the Caucasus; widespread in the Balkan Peninsula.

V. monanthos (L.) Desf. Flor. Atl. 2, 165 (1798).

Above Simopetra, 13.4.34, on dry stony bank, no. 2341.

Pale blue corollas with darker veins on standards.

Distribution: Mediterranean Basin; Greece, Cyclades, Thessaly, S. Macedonia, Dalmatia.

V. pubescens (DC.) Link Handb. 2, 190 (1831).

S. E. of Pyrgos, in ravine, 14.4.34, coll. H. G. Chick, no. 2602.

Pale bluish corollas.

Distribution: Mediterranean Basin; Crete, Greece, S. Macedonia, Rodope Massif, Montenegro, Dalmatia, Istria.

V. sativa L. Sp. Pl. 736 (1753) subsp. **notata** (Gilib.) Aschers. et. Graebn. Syn. Flor. Mitt.-Eur. 6, 2, 963 (1909).

Near Chilandari, 22.4.34, sandy fields near the sea, no. 2682.

Purple corollas.

Distribution (of species): General European, Mediterranean Region, Caucasus; general in the Balkan Peninsula.

V. villosa Roth Tent. Flor. Germ. 2, 2, 182 (1793).

Simopetra, between the monastery and the arsenal, 13.4.34, amongst brushwood, no. 2357.

Deep violet-mauve corollas; rather large leaflets.

Distribution: General European, Mediterranean Region, Caucasus; most districts of the Balkan Peninsula, but not Crete.

ROSACEAE

Aremonia Agrimonoides (L.) DC. Prodr. 2, 588 (1825).

Above Lavra, on slopes of Athos peak, 20.4.34, in stony shady places, no. 2519.

Distribution: S.E. Central Europe, Mediterranean Basin east to Caucasus, general in the Balkan Peninsula, but not in Crete.

Crataegus monogyna Jacq. Flor. Austr. 3, 50, t. 292, fig. 1 (1775).

Above the Roumanian Prodomos Skete, 19.4.34, dry slopes in macchia, not on limestone, no. 2493.

Distribution: General European, Mediterranean Region, Caucasus; general in the Balkan Peninsula.

Fragaria vesca L. Sp. Pl. 494 (1753) ?

Above Simopetra, 13.4.34, no. 2338.

Pink sepals show between white petals.

Distribution: E.N. Temperate Region; general in the Balkan Peninsula, but not in Crete.

The hairs on the pedicels are spreading to sub-spreading and in this respect the specimens are intermediate between *F. vesca* L. and *F. moschata* Duch. (*F. elatior* Ehrh.).

Potentilla geoides *M. Bieb.* Flor. Taur.-Cauc. 1, 404 (1808).

High above Lavra, 800 m., on slopes of Athos peak, 20.4.34, shady places in *Abies* forest, no. 2528. Pale yellow petals.

Distribution : Dacian, Crimean, and Caucasian ; Rodope Massif.

The material is young and the differences between *P. geoides* and some of the numerous varieties of *P. rupestris* L. (sensu Th. Wolf in Bibl. Bot. 16, 124 : 1908) are none too clear. The flowers of our Athos material are rather smaller and the leaf-cutting is rather less deep than in the Crimean and Caucasian specimens of *P. geoides* at Kew. On the other hand, the shorter, pale yellow, not white, petals, the longer styles, and the more erect, less open and spreading, flower parts, all point to *P. geoides* and not to *P. rupestris*.

P. reptans L. Sp. Pl. 499 (1753).

Hills behind Pyrgos, 3.5.34, *Mrs. Loch* no. 4.

Distribution : E.N. Temperate Region ; general in the Balkan Peninsula.

Poterium spinosum L. Sp. Pl. 994 (1753).

Between Pyrgos and Xerxes Canal, 17.4.34, locally dominant in phrygana on slopes to the south-east of the Canal, forming rounded cushions, no. 2457 ; cultivated in the Herbarium Ground, Kew, 1935-36, as K. 1543, from seed collected near Vatopedi, 11.7.34, *H. G. Tedd.* At Kew the species suffered in the winter and early spring frosts, but 5 out of 12 plants survived, forming much dark green foliage in the spring and large bushes in the summer of 1936, but not flowering.

Distribution : Mediterranean Basin ; general in the Mediterranean and Transitional districts of the Balkan Peninsula.

Sorbus torminalis (L.) Cr. Stirp. Austr. 2, 45 (1763).

Above Lavra, 20.4.34, in high macchia, no. 2533.

Distribution : Central Europe and Mediterranean Basin east to the Caucasus ; widespread in the Balkan Peninsula, but not in Crete.

SAXIFRAGACEAE

Saxifraga hederacea L. Sp. Pl. 405 (1753).

Below Zographu Monastery, 16.4.34, on damp wall in shade, no. 2417.

Plants growing in clumps, with small white petals.

Distribution : E. Mediterranean Basin ; Crete, Greece, S. Macedonia, Athos Peninsula, Dalmatia.

S. rotundifolia L. Sp. Pl. 403 (1753) var. *hirsuta* *Sternb.* Rev. Saxifr. Suppl. 2, 16 (1831).

High above Simopetra, on the ridge on the way to Karyes, 740 m., 13.4.34, amongst rocks in the woods, no. 2315 ; near Iviron, 20.4.34, shady stream bank, no. 2547.

Petals white, with more or less marked red spots.

Distribution (of species) : Central Europe and E. Mediterranean Basin ; widespread in the Balkan Peninsula, but not in Crete.

S. sancta *Griseb.* Spic. Flor. Bithyn. et Rumel. 1, 333 (1843).

Mt. Athos peak, 1900 m., 12.7.34, crevices in limestone rocks, *H. G. Tedd.* s.n.

Distribution : Athos and N.W. Asia Minor.

S. tridactylites L. Sp. Pl. 404 (1753).

Cultivated in the Herbarium Ground, Kew, 26.6.35 and 6.5.36 as K. 1479, from seed collected on a wall near Chilandari, 22.4.34.

Distribution : N. Temperate Region ; widespread in the Balkan Peninsula.

CRASSULACEAE

Cotyledon pendulinus (DC.) Batt. in Batt. et Trab. Flor Algér. 329 (1889).

Umbilicus pendulinus DC. Plant. Grass. t. 162 (1799-1829).

Simopetra, just above the arsenal, 13.4.34, stony places, no. 2363 ; hills behind Pyrgos, 15.6.34, *Mrs. Loch* no. 5.

Distribution : W. Europe and Mediterranean Basin ; fairly widespread in the Balkan Peninsula.

Sedum glaucum *W. et K.* Pl. Hung. 2, 198 t. 181 (1805) var. **Buxbaumii** (Griseb.) Hayek Prodr. 1, 629 (1925).

Below Zographu Monastery, 16.4.34 on stony and rocky ground in macchia, no. 2422.

Petals white with pink veins.

Distribution (of species) : Central Europe, Mediterranean Region, Caucasus ; general in the Balkan Peninsula, but not in Crete.

S. Grisebachii *Heldr.* in Boiss. Diagn. 2, ii. 61 (1856). *S. annuum* L. var. *racemiferum* Griseb. Spic. 1, 325 (1843).

Hills behind Pyrgos, June 1934, *Mrs. Loch* no. 22.

Distribution : Balkan Peninsular type, east to Bithynia ; Greece, Thessaly, N. and S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif, Dalmatia.

This species is very near to *S. annuum* L. The best differential character appears to be the longer, narrower, and more acuminate petals.

S. litoreum *Guss.* Pl. Rar. 185, t. 37 (1826).

Chilandari, 22.4.34, on walls, no. 2672.

Pale dirty yellow-coloured petals ; 10 stamens.

Distribution : E. Mediterranean Basin ; Crete, Greece, Cyclades, Thessaly, S. Macedonia, Montenegro.

S. ochroleucum *Chaix* ap. Vill. Hist. Pl. Dauph. 1, 325 (1786). *S. anopetalum* DC. Mém. Soc. Agr. Par. 11, 12, n. v. ; Rapports Voyages 2, 80 (1808).

Near summit of Mt. Athos, 1600–1800 m., 12.7.34, rocky slopes and rock crevices, *H. G. Tedd* s.n.

Distribution : Central Europe and Mediterranean Basin ; fairly widespread in the Balkan Peninsula.

Praeger, "An account of the genus *Sedum* as found in cultivation," in Journ. Roy. Hort. Soc. 46, 273 (1921), without any clear reason uses the name *S. anopetalum* DC.

Sempervivum marmoreum *Griseb.* Spic. 1, 329 (1843).

Near the summit of Mt. Athos, 1600–1900 m., on rough rocky slopes and rock crevices, *H. G. Tedd*, s.n.

Distribution : Dacian and Pannonian ; widely spread in the Balkan Peninsula, but not in Crete.

This is excellent material of the species from the type locality. The name antedates *S. Schlehanii* Schott in Oesterr. Bot. Wochenblatt 3, 12 (1853). See Praeger, An account of the *Sempervivum* Group, 59 (1932) and Turrill in Bull. Soc. Bot. Bulg. 7, 124, 1936.

Tillaea muscosa L. Sp. Pl. 129 (1753).

Mulyani Islands : Pontiko Island, 15.4.34, in dry stony places, no. 2385.

Distribution : Central Europe and Mediterranean Basin ; Crete, Greece, Cyclades, S. Macedonia, Thrace, N. Bulgaria.

MYRTACEAE.

Myrtus communis L. Sp. Pl. 471 (1753).

Between Lavra and its arsenal, 20.4.34, in high macchia, no. 2510 ; Sithonia (Longos) Peninsula, 19.4.34, coll. *H. G. Chick* and *H. G. Tedd*, no. 2644.

Distribution : Mediterranean Region ; Mediterranean districts of the Balkan Peninsula.

UMBELLIFERAE.

Cnidium silaifolium (*Jacq.*) *Simk.* Enum. Flor. Transs. 259 (1886).

Mt. Athos peak, 1550–1900 m., 12.7.34, rocky places, *H. G. Tedd*, no. 1523.

Flowers white ; plants about 2 feet high.

Distribution : Central and S. Europe ; fairly widespread in the Balkan Peninsula.

Crithmum maritimum L. Sp. Pl. 246 (1753).

Mulyani Islands : small island opposite Pyrgos, 13.4.34, coll. *H. G. Chick*, no. 2641.

Distribution : Western Europe, Mediterranean Basin, east to the Caucasus ; general in the coastal districts of the Balkan Peninsula.

Ferulago monticola Boiss. et Heldr. in Boiss. Diagn. 2, ii. 91 (1856).

Near Xenophontos, 18.4.34, stony bare ground in olive-groves, no. 2467.

The leaves on the stem are vertically adpressed. Flowers yellow. The specimens are young and the identification is not quite certain. See Turrill in Kew Bull. 1924, 338.

Distribution : Balkan Peninsular endemic ; fairly widely spread in N. Greece and in the central districts of the Balkan Peninsula.

Pimpinella Tragium Vill. Hist. Pl. Dauph. 2, 605 (1787).

Athos peak, above Panaghia, 1700–1900 m., 12.7.34, rocky places, *H. G. Tedd* no. 1530.

White flowers.

Distribution : Mediterranean Region and the Caucasus ; widespread in the Balkan Peninsula.

Scandix Pecten-Veneris L. Sp. Pl. 256 (1753).

S.E. of Pyrgos, 15.4.34, in a ravine, coll. *H. G. Chick*, no. 2605.

Distribution : Central Europe and Mediterranean Basin east to Caucasus ; general in the Balkan Peninsula.

Smyrniurn Orphanidis Boiss. Flor. Or. 2, 925 (1872).

Kapsokalyvia, 19.4.34, among stones on hot dry slopes, no. 2473.

Distribution : Balkan Peninsular type, east to the Troad ; Greece, Cyclades, S. Macedonia, Athos Peninsula.

Torilis arvensis (Huds.) Lk. Enum. 1, 265 (1821) var. **purpurea** (Ten.) Hal. Consp. 1, 629 (1901).

South of Pyrgos, 24.4.34, in bare sandy ground above the sea, no. 2741.

Distribution (of species) : General European and Mediterranean Basin ; general in the Balkan Peninsula.

This plant was accepted as a distinct species by Tenore and by Gussone. Hayek (Prodr. 1, 1057 : 1927) makes it a subspecies of equal rank with subsp. *eu-arvensis* and subsp. *neglecta*. The species (s.l.) would repay detailed investigation.

CAPRIFOLIACEAE.

Lonicera etrusca Santi Viagg. 1, 113, t. 1 (1795).

Mulyani Islands : Frying Pan Island, 5.6.34, *Mrs. Loch* no. 17 ; Mt. Athos peak, Panaghia, 1550 m., 12.7.34, on rocky slopes and scree, *H. G. Tedd* no. 1504. A straggling bush about 2 ft. high with yellow flowers.

Distribution : Mediterranean Basin ; widespread in the Balkan Peninsula.

RUBIACEAE.

Asperula athoa Boiss. Diagn. 1, x. 62 (1849).

Mt. Athos peak, 1700–1970 m., in tufts in crevices of limestone rock, *H. G. Tedd* no. 1485.

Corollas chocolate-coloured.

Distribution : endemic to Athos.

Crucianella latifolia L. Sp. Pl. 109 (1753) var. **monspeliaca** (L.) DC. Prodr. 4, 586 (1830).

South of Pyrgos, 24.4.34, bare places on *Cistus*-clad slopes facing the sea, no. 2727.

Distribution (of species): Mediterranean Basin east to the Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

Galium asparagifolium Boiss. et Heldr in Boiss. Diagn. 2, vi. 91 (1859).

Mt. Athos peak, Panaghia, 12.7.34, 1700 m., in rock crevices and among rocks and stones, *H. G. Tedd* no. 1506.

Flowers yellow.

Distribution: Greece.

This species was originally described from Mt. Parnassus, near Rachova and Gourná. It was reduced by Halácsy (Consp. 1, 713: 1901) to a variety of *G. scabrifolium* (Boiss.) Hausskn. and by Hayek (Prodr. 2, 464: 1930) to a variety of *G. firmum* Tausch.

G. Cruciata (L.) Scop. Flor. Carn. ed. 2, 1, 100 (1772).

Asbestochori Cemetery, N. of Salonika, 11.4.34, no. 2590.

Yellow corollas.

Distribution: E.N. Temperate Region; general in the Balkan Peninsula, but not in Crete.

G. murale (L.) All. Flor. Pedem. 1, 8, t. 77, f. 1 (1785).

Near Chilandari, 22.4.34, on walls, no. 2669.

Distribution: Mediterranean Basin, widespread in the Mediterranean and Transitional districts of the Balkan Peninsula.

Rubia Olivieri Rich. Mem. Soc. Nat. Par. 5, 132 (1834).

Near Kapsokalývia, 19.4.34, bushy limestone slopes, no. 2483.

Leaves thick and broad.

Distribution: E. Mediterranean Basin; Crete, Greece, Thrace.

Sherardia arvensis L. Sp. Pl. 102 (1753).

Mulyani Islands: 15.4.34, dry stony places, no. 2384.

Distribution: Central Europe and Mediterranean Region; general in the Balkan Peninsula.

VALERIANACEAE.

Kentranthus ruber (L.) DC. Flor. Fr. 4, 239 (1805).

Mt. Athos peak, Panaghia, 1550 m., on rocky scree, *H. G. Tedd* no. 1505.

Flowers bright pink-red; plant about 1-2 ft. high.

Distribution: Mediterranean Basin; Mediterranean districts of the Balkan Peninsula.

Valeriana Dioscoridis S. et S. Prodr. 1, 21 (1806).

Simopetra, between the arsenal and the monastery, 13.4.34, in brushwood, no. 2356.

White corollas.

Distribution: Oriental; Greece, Thessaly, Albania, N. and S. Macedonia, Athos Peninsula, Montenegro.

Valerianella carinata Lois. Not. 149 (1810).

Below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2418.

Distribution: General European and Mediterranean Region, widespread in the Balkan Peninsula.

DIPSACACEAE.

Pterocephalus perennis (L.) Coult. Mem. Dips. 33 (1823).

Mt. Athos peak, Panaghia and upwards, 1550-1700 m., 12.7.34, rocks and stony places, usually in rock crevices, *H. G. Tedd* no. 1508.

Flowers pale pink.

Distribution: Balkan Peninsular endemic; Greece, Thessaly, Epirus, Albania, Athos Peninsula.

Scabiosa Webbia Don in Bot. Reg. t. 717 (1823).

Mt. Athos peak, above Panaghia, 1700 m., 12.7.34, rocky places, *H. G. Tedd* no. 1529.

Flowers white.

Distribution : E. Mediterranean Region ; Greece, Thessaly, Epirus, N. and S. Macedonia, Athos Peninsula, Thrace, Serbia, Montenegro.

COMPOSITAE.

Andryala dentata S. et S. Prodr. 2, 140 (1813).

South of Pyrgos, 24.4.34, in sandy ground and among boulders by the sea, no. 2739.

Greyish softly glandular and floccose plants ; florets lemon-yellow.

Distribution : Italy, Sicily, and E. Mediterranean Basin ; Greece, Cyclades, Athos Peninsula.

Anthemis Sibthorpii Griseb. Spic. 2, 210 (1844).

Mt. Athos peak, 1970 m., 12.7.34, rock crevices at the summit, only one specimen accessible, H. G. Tedd no. 1494.

The plant has a pungent odour ; florets yellow.

Distribution : Athos endemic.

A. tomentosa L. Sp. Pl. 893 (1753) subsp. *peregrina* (L.) Hayek Prodr. 2, 630 (1931).

Mulyani Islands : Pontiko Island, 15.4.34, sandy and rocky ground above the sea, no. 2400, and cultivated in the Herbarium Ground, Kew, 13.7.35, from the same locality, as K. 1494 ; Lavra, rocky ground by the arsenal, 20.4.34, no. 2531.

Leaves rather fleshy. White ray and yellow disc florets.

Distribution (of species) : E. Mediterranean Basin ; Greece, Corfu, S. Macedonia, Thrace.

Bellis hybrida Ten. Syll. 436 (1831).

Below Lavra, 20.4.34, side of path, n. 2530.

Distribution : S. Europe ; Crete, Greece, Thessaly, Corfu, N. and S. Macedonia, Thrace.

Calendula arvensis L. Sp. Pl. ed. 2, 1303 (1763).

Simopetra, above the arsenal, 13.4.34, in open stony places, no. 2364 ; Mulyani Islands : small island off Pyrgos, 13.4.34, coll. H. G. Chick, no. 2596.

Distribution : Mediterranean Region ; Mediterranean and Transitional districts of the Balkan Peninsula.

Carduus armatus Boiss. et Heldr. in Boiss. Diagn. 1, vi. 104 (1845).

Mt. Athos peak, 1900 m., 12.7.34, rocks, H. G. Tedd no. 1572.

Plant about 1 ft. high ; florets pink to red.

Distribution : Balkan Peninsular endemic ; Greece, Thessaly, Epirus, Albania, N. Macedonia, Athos Peninsula, Thracian Islands, Rodope Massif.

The Athos plant is more nearly glabrous than most material from other districts. Halácsy's varietal epithet, in Herb. Kew. as *C. cronius* Boiss. et Heldr. var. *glabratus* Hal. does not appear to have been published.

C. pycnocephalus L. Sp. Pl. ed. 2, 1151 (1763).

Stavronikita, near the monastery, 21.4.34, bare rocky slopes, no. 2560.

Flowers pink.

Distribution : Central Europe, Mediterranean Region, Caucasus ; widespread in the Balkan Peninsula.

Centaurea athoa DC. Prodr. 6, 588 (1837). *C. rupestris* subsp. *athoa* (DC.) Gugl. in Ann. Mus. Hung. 6, 194 (1907).

Mt. Athos peak, Panaghia, 1550 m., 12.7.34, rocks and stony places, H. G. Tedd no. 1507.

Prostrate habit ; yellow florets.

Distribution : Athos endemic.

C. chalcidicaea Hayek in Oesterr. Bot. Zeitschr. 64, 359 (1914).

Mt. Athos peak, 1550—1700 m., 12.7.34, rocks and stony places, H. G. Tedd no. 1491.

Sprawling flat habit ; florets bright pink.

Distribution : Athos endemic.

C. Grisebachii Nym. Consp. 427 (1878).

Mulyani Islands : Frying Pan Island, 5.6.34, *Mrs. Loch* no. 18.

Distribution : Balkan Peninsular endemic ; Greece, Thessaly, Epirus, Albania, N. and S. Macedonia, Thracian Islands, N. and S. Bulgaria, Rodope Massif, Serbia, Hercegovina.

C. pannosa DC. Prodr. 6, 582 (1837).

Near Vatopedi, 13.7.34, sandy places on and near the sea-shore, *H. G. Tedd* no. 1532.

Plants about 2 ft. high ; florets bright pink.

Distribution : Athos endemic.

Chrysanthemum segetum L. Sp. Pl. 889 (1753).

Near Stavronikita, 21.4.34, bare rocky slopes, no. 2558.

Distribution : Europe and Mediterranean Basin east to Caucasus ; Crete, Greece, Cyclades, Thessaly, Epirus, Corfu, S. Macedonia, Athos Peninsula, Thrace, Dalmatia.

Cnicus benedictus L. Sp. Pl. 826 (1753).

Above Pyrgos, 25.4.34, on bare granitic slopes, no. 2756.

Distribution : Mediterranean Region, Caucasus ; Mediterranean and Transitional districts of the Balkan Peninsula.

Crepis neglecta L. Mant. 107 (1767) var. **fuliginosa** (S. et S.) Ch. et B. Flor. Pelopon. 55 (1838).

Between Pyrgos and Xerxes Canal, on bare stony ground, no. 2449.

Capitulum buds nodding.

Distribution (of species) : E. Mediterranean Basin ; widespread in the Balkan Peninsula.

C. pulchra L. Sp. Pl. 806 (1753) var. **adenoclada** Hausskn. in Mitt. Thür. Bot. Ver. N.F. 7, 53 (1895).

South of Pyrgos, 24.4.34, bare slopes above the sea, no. 2724.

Leaves very sticky ; florets yellow.

Distribution (of species) : General European, Mediterranean Region, Caucasus ; Thessaly, N. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif, Dobruja, Serbia, Dalmatia, S. Croatia, Istria.

Crupina Crupinastrum (Moris) Vis. Flor. Dalm. 2, 42, t. 51, f. 3 (1847).

Near Dionysiou, 18.4.34, in strong open places in macchia, no. 2466.

Florets rather few about 10 or fewer in every capitulum.

Distribution : Dacian and Mediterranean Basin ; widespread in Mediterranean and Transitional districts of the Balkan Peninsula.

Doronicum Columnae Ten. Flor. Nap. Prodr. 49 (1811-15) "f." **orientale** Hayek in Denk. K. Akad. Wiss. Wien 94, 196 (1917).

Hills beyond Pyrgos, 11.4.34, coll. *H. G. Chick*, no. 2624.

Distribution (of species) : Central Europe and Mediterranean Region ; widespread in the Balkan Peninsula, but not Crete.

Filago gallica (L.) L. Sp. Pl. Add. (1753).

Near Pyrgos, 17.4.34, bare ground in macchia, no. 2451.

Distribution : Central Europe and Mediterranean Basin ; Mediterranean and Transitional districts of the Balkan Peninsula.

F. germanica L. Syst. ed. 10, 1235 (1759).

Mulyani Islands : small island off Pyrgos, 15.4.34, stony grassy places, no. 2379.

Distribution : E.N. Temperate Region ; general in the Balkan Peninsula.

Hedypnois rhagadioloides (L.) Willd. Sp. Pl. 3, 1617 (1804) subsp. **cretica** (L.) Hayek Prodr. 2, 807 (1931).

South of Pyrgos, 24.4.34, bare stony ground, no. 2738.

Florets yellow.

Distribution (of species) : Mediterranean Region, Caucasus ; Mediterranean and Transitional districts of the Balkan Peninsula.

Helichrysum virgineum (S. et S.) Boiss. Flor. Or. 3, 238 (1875).

Mt. Athos, 1934, comm. Mrs. Loch, no. 36.

"Flowers blessed by the foot of the Virgin at the top or near the top of Athos, brought by 'The Herbalist'."

Distribution : Athos endemic.

Hypochoeris cretensis (L.) Ch. et B. Exp. 237 (1832).

Hills above Pyrgos, 27.4.34, no. 2589.

Florets very pale lemon.

Distribution : Italy ; Crete, Greece, Cyclades, Thessaly, Epirus, S. Macedonia, Thrace.

H. glabra L. Sp. Pl. 811 (1753).

Near Stavronikita, 21.4.34, on mica-schist slopes in macchia on bare ground towards Pantokratoros, no. 2551 ; grown in the Herbarium Ground, Kew, 13.7.35 and 5.7.35, as K. 1453, from seeds collected on hills above Pyrgos, 25.4.34.

Distribution : General European and Mediterranean Basin ; Crete, Greece, Cyclades, S. Macedonia, Thrace, N. Bulgaria, Rodope Massif, Serbia, Montenegro, Istria.

Inula viscosa (L.) Ait. Hort. Kew. ed. 1, 3, 223 (1789).

Pyrgos, 20.9.34, Mrs. Loch no. 10.

Distribution : Mediterranean Basin ; Mediterranean and Transitional districts of the Balkan Peninsula.

Jurinea mollis (L.) Reichb. Flor. Germ. exc. 290 (1831).

Between Dochiariou and Xenophontos, 18.4.34, dry places in macchia, no. 2468.

Distribution : Central Europe and east to the Caucasus ; widespread in the Balkan Peninsula, but not in Crete.

The specimen is young. It was from this same area on the Athos Peninsula that the type material of *Jurinea Hartmannii* Beauv. in Bull. Soc. Bot. Genève 2 me Sér. 6, 153 (1914) was obtained. Our plant has, however, much more divided leaves (except for those on a lateral non-flowering shoot) and in the early phase of development in which it was collected is indistinguishable from the widely spread *J. mollis* (L.) Reichb.

Lagoseris sancta (L.) K. Maly in Glas. 20, 556 (1908).

Below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2421.

Distribution : E. Mediterranean Basin ; widespread in the Balkan Peninsula.

Leontodon crispus Vill. subsp. **asper** (W. et K.) Rohl. var. **setulosus** (Hal.) Hayek Prodr. 2, 813 (1931).

Mt. Athos peak, 1900 m., rock crevices, 12.7.34, H. G. Teed no. 1516, florets yellow, with outer ligules darker orange-red ; near Zographu Monastery, 16.4.34, stony ground in macchia, no. 2414.

Distribution (of species) ; Central Europe, Pontic, Caucasus ; general in the Balkan Peninsula, but not in Crete.

L. tuberosus L. Sp. Pl. 799 (1753).

Above Pyrgos, 25.4.34, grassy spot on granitic slopes, no. 2754.

L. tuberosus L. var. **Olivieri** (DC.) Hayek Prodr. 2, 815 (1931).

Below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2428.

Distribution (of species): Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

Matricaria Chamomilla L. Sp. Pl. 891 (1753).

Near Pyrgos, 24.4.34, in dry open stony places, no. 2750.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

Pallenis spinosa (L.) Cass. in Dict. Sci. Nat. 37, 276 (1825).

Grown in the Herbarium Ground, Kew, 20.8.35 and 21.9.35 as K. 1469, from seeds collected between Pyrgos and the Xerxes Canal, 17.4.34.

Distribution: Europe, Mediterranean Region, and Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

Phagnalon graecum Boiss. et Heldr. in Boiss. Diagn. 1, xi, 6 (1849). *P. rupestre* (L.) DC. subsp. *graecum* (Boiss. et Heldr.) Hayek Prodr. 2, 600 (1931).

Below Zographu Monastery, 16.4.34, rocky ground in macchia, no. 2427.

Distribution: E. Mediterranean Basin; Crete, Greece, Cyclades, Thessaly, Corfu, Albania, Thrace, Dalmatia.

Picris pauciflora Willd. Sp. Pl. 3, 1557 (1804).

Kapsokalývia, 19.4.34, limestone slopes above sea, no. 2490, flowers yellow; south-east of Pyrgos, 24.4.34, on *Cistus*-clad slopes above the sea, no. 2729, flowers pale yellow.

Distribution: Mediterranean Region and the Caucasus; Crete, Greece, Cyclades, Thessaly, Epirus, N. and S. Macedonia, Thrace, Rodope Massif.

No. 2729 is a much-branched plant with a rather stout stock for an annual and much more luxuriant growth than is usual in the species.

Scorzonera mollis M. Bieb. Flor. Taur-Cauc. 3, 522 (1819).

Above Chilandari, 23.4.34, in open macchia, no. 2700.

Florets yellow.

Distribution: Oriental, Caucasus; Crete, Greece, Cyclades, Epirus, Corfu, N. and S. Macedonia, Thrace, S. Bulgaria, Rodope Massif, Dobruja.

Senecio lividus L. Sp. Pl. 867 (1753).

Between Stavronikita and Pantokratoros, 21.4.34, bare stony ground on slopes in macchia, no. 2554.

Distribution: Mediterranean Basin; Greece, Cyclades, Athos Peninsula,

S. vernalis W. et K. Pl. Rar. Hung. 1, 23, t. 24 (1802).

Behind and to S.E. of Pyrgos, 15.4.34, in shady ravine, coll. H. G. Chick, no. 2613; south-east of Pyrgos, bare slopes above sea, 24.4.34, no. 2723; grown in the Herbarium Ground, Kew, 20.6.35, as K. 1461, from seeds collected near the Russian Skete, just south-east of the wall of the Holy Territory, 23.4.34.

Distribution: Central Europe, Oriental, Caucasus; Greece, Thessaly, Epirus, Corfu, N. and S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif, Dobruja, Serbia, Montenegro.

Sonchus asper (L.) Hill Brit. Herb. 1, 47 (1769) subsp. *glaucescens* (Jord.) Hayek Prodr. 2, 840 (1931). *S. glaucescens* Jord. Obs. 5, 75, t. 5 (1847).

Mulyani Islands: small island off Pyrgos, 13.4.34, coll. Mrs. Loch and H. G. Chick, no. 2611; grown, from seeds collected on the Mulyani Islands: Pontiko Island, 25.4.34, in the Herbarium Ground, Kew, 21.9.35, as K. 1477.

Distribution (of species): Cosmopolitan; widespread in the Balkan Peninsula.

Taraxacum. The species of this genus have been named from Handel-Mazzetti: Monographie der Gattung Taraxacum, Leipzig und Wien, 1907, and not on the basis of apomicts.

Taraxacum Hoppeanum Griseb. et Schenk in Wiegmann Arch. 18, 1, 349 (1852) sec. Hand.-Mazz. Monogr. Tarax. 105 (1907).

Asbestochori Cemetery, N. of Salonika, 11.4.34, in open grassy turf, no. 2655.

The following table is a list of specimens grown, from fruits collected on Athos Peninsula, in the Herbarium Ground, Kew.

Number	Locality	Date of collect- ing	In flower at Kew	Remarks
Z.189	Lavra	19.4.34	8.6.36	Rather large plants
Z.190	Near Chilandari ...	22.4.34	9.5.36	Brownish-red cypsels
Z.191	Between Kapsokalývia and Lavra	19.4.34	23.4.36	Cypsels scarcely 4 mm. long, brownish red
Z.192	Between Simopetra and Karyes	13.4.34	23.4.36	Brownish-red cypsels
Z.194	Vatopedi	21.4.34	23.4.36	Cypsels red
Z.195	S.E. of wall of Holy Territory	24.4.34	9.5.36	Brownish-red cypsels
Z.196	Between Simopetra and Karyes	13.4.34	9.5.36	Brownish-red cypsels. Polymorphic in leaf- shape
Z.197	Near Chilandari ...	22.4.34	23.4.36	Brownish-red cypsels
Z.198	Near Zographu ...	16.4.34	23.4.36	Red cypsels
Z.200	Near Stavronikita ...	21.4.34	23.4.36	Red cypsels
Z.201	Kapsokalývia ...	19.4.34	23.4.36	Red cypsels
Z.202	Chilandari Arsenal ...	22.4.34	23.4.36	Red cypsels
Z.203	Isphigmenou ...	22.4.34	23.4.36	Red cypsels
Z.204	Between Simopetra and Karyes	13.4.34	23.4.36	Red cypsels

Distribution: Central Europe; Athos Peninsula, Montenegro, Bosnia, Herzegovina, Dalmatia, S. Istria.

T. megalorrhizon (*Forsh.*) *Hand.-Mazz.* Monogr. Tarax. 35 (1907).

Asbestochori Cemetery, N. of Salonika, 11.4.34, no. 2654; grown in the Herbarium Ground, Kew, as Z. 193, 23.4.36, from fruits collected above Zographu Arsenal, 16.4.34; grown in the Herbarium Ground, Kew, as Z. 199, 23.4.36, from fruits collected near Xerxes Canal, 17.4.34.

Distribution: Mediterranean Basin, Mediterranean and Transitional districts of the Balkan Peninsula.

T. obliquum (*Fries.*) *Dahlst.* in Bot. Not. 1905, 752, 164.

Grown in the Herbarium Ground, Kew, as Z. 188, 20.6.36, from fruits collected near Zographu Arsenal, 16.4.34.

Distribution: Europe and Orient; Thessaly, S. Macedonia, Serbia, Bosnia, Dalmatia.

Tolpis umbellata *Bert.* Rar. lig. pl. 1, 13 (1803) n.v. et Flor. Ital. 8, 541 (1850).

Between Chilandari and Pyrgos, 23.4.34, in open places in macchia, no. 2713.

Florets pale yellow.

Distribution: Mediterranean Basin; Crete, Greece, Cyclades, Thessaly, S. Macedonia, Thrace.

Tragopogon dubius *Scop.* Flor. Carn. ed. 2, 2, 95 (1772). *T. major* Jacq. Flor. Austr. 1, 19, t. 29 (1773).

Simopetra, between the monastery and the arsenal, 13.4.34, on dry stony ground, no. 2354; grown in the Herbarium Ground, Kew, 13.7.35, as K. 1463, from seeds collected south-east of the wall of the Holy Territory, 24.4.34.

Distribution : Central Europe, Pontic, Caucasus ; fairly widespread in the Balkan Peninsula, but not in Crete.

No. 2354 is named with some hesitation. It has a peduncle thickened in the upper part and the leaves agree with *T. dubius*. The florets, however, are longer than the phyllaries, and the root is thicker than is usual in this species.

Tyrimnus leucographus (L.) Cass. Dict. 41, 335 (1826).

Near Kapsokalyvia, 19.4.34, on dry limestone above the sea, no. 2498.

Distribution : Mediterranean Basin ; Mediterranean and Transitional districts of the Balkan Peninsula.

Urospermum picroides (L.) F. W. Schmidt Samml. Phys. Aufs. 1, 275 (1795) sec. I.K., n.v. ; *Tragopogon picroides* L. Sp. Pl. 790 (1753).

Grown in the Herbarium Ground, Kew, 13.7.35 and 21.9.35, as K. 1483, from seeds collected S.E. of the wall of the Holy Territory, 24.4.35.

Distribution : Mediterranean Region and the Caucasus ; Mediterranean and Transitional districts of the Balkan Peninsula.

The specimens are short and much branched and have small capitula. These characters are probably due to the unfavourable conditions of cultivation.

Zacintha verrucosa Gaertn. De Fruct. et Sem. Pl. 2, 358 (1791).

Above Pyrgos, 25.4.34, on *Cistus*-clad granitic slopes, no. 2753.

Distribution : Mediterranean Basin ; Mediterranean and Transitional districts of Balkan Peninsula.

CAMPANULACEAE.

Campanula Erinus L. Sp. Pl. 169 (1753).

Near Chilandari, 22.4.34, on walls, no. 2675.

Distribution : Mediterranean Region ; Mediterranean and Transitional districts of the Balkan Peninsula.

C. lingulata W. et K. Pl. Rar. Hung. 1, 65, t. 64 (1802).

Simopetra, between the arsenal and the monastery, 13.4.34, dry stony ground, no. 2352 ; on upper beach, beyond Pyrgos, 12.4.34, coll. H. G. Chick, no. 2598.

Distribution : Pannonian ; general in the Balkan Peninsula, but not in Crete or Greece.

C. Orphanidea Boiss. Flor. Or. 3, 897 (1875).

Mt. Athos peak, 1900–1970 m., 12.7.34, dwarf tufted plant of rock crevices, infrequent, H. G. Tedd nos. 1486, 1487, 1487A.

Corollas darkish blue ; plants of prostrate habit.

Distribution : endemic in the Balkan Peninsula ; Rodope Massif, Athos Peninsula.

C. rotundifolia L. Sp. Pl. 163 (1753) subsp. **sancta** Hayek Prodr. 2, 540 (1930) e descr.

Mt. Athos peak, 1550–1970 m., 12.7.34, rock crevices towards the top, H. G. Tedd no. 1495.

Corollas dark blue ; plants 4–6 ins. high.

Distribution (of species) : N. Temperate Region ; central and northern districts of the Balkan Peninsula.

C. rupestris S. et S. Prodr. 1, 142 (1806) subsp. **eu-rupestris** Hayek. var. **Andrewsii** (DC) Hayek Prodr. 2, 525 (1930). *C. Andrewsii* DC. Monogr. Camp. 220 (1830).

Near Simopetra arsenal, 6 m., 13.4.34, on rocks, no. 2347 ; Dochiariou, 18.4.34, on wall, no. 2504, flowers pale bluish-mauve ; grown in the Herbarium Ground, Kew, 19.7.35 (seedlings), as K. 1544, from seeds collected near Vatopedi, 12.7.34, H. G. Tedd.

Distribution (of species) : Balkan Peninsular endemic ; Greece, Thessaly, Athos Peninsula.

C. phrygia *Jaub. et Spach* Illustr. Pl. Or. 3, 42, t. 233 (1847-50).

South-east of Pyrgos, 24.4.34, edge of bare sandy fields, no. 2744; hills behind Pyrgos, 11.6.34, *Mrs. Loch* no. 3, a depauperated form with shortened inflorescence branches, and the identification is somewhat doubtful.

Distribution: E. Mediterranean Basin; Thessaly, N. and S. Mediterranean, Athos Peninsula, Thrace, S. Bulgaria, Rodope Massif, Serbia.

Legousia Speculum-Veneris (L.) *Fisch.* ex Schinz et Thell. in Bull. Herb. Boiss. sér. 2, 7, 343 (1907) var. **pubescens** (DC.) *K. Maly* in Mag. Bot. Lap. 7, 236 (1908).

Xerxes Canal, edge of cultivated fields, 17.4.34, no. 2434.

Distribution (of species): Mediterranean Basin east to Caucasus; general in the Balkan Peninsula.

ERICACEAE.

Arbutus Andrachne L. Sp. Pl. ed. 2, 566 (1762).

Above Panteleëmon, 14.4.34, in high macchia, no. 2265.

Distribution: E. Mediterranean Basin east to the Caucasus; S. and E. Mediterranean districts of the Balkan Peninsula.

A. Unedo L. Sp. Pl. 395 (1753).

Near Zographu Monastery, 16.4.34, in high macchia, no. 2406; below Zographu Monastery, 16.4.34, in high macchia, no. 2415; between Lavra and its arsenal, 20.4.34, in high macchia, nos. 2509, 2512, 2513; Sithonia (Longos) Peninsula, near Armisti, 19.4.34, coll. *H. G. Tedd*, no. 2663.

Distribution: W. Europe and Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

Erica arborea L. Sp. Pl. 353 (1753).

Simopetra, between arsenal and monastery, 13.4.34, in macchia, no. 2283, white flowers; plateau between Chilandari and Pyrgos, 23.4.34, in macchia under *Pinus halepensis* and *P. Pinea*, no. 2692.

Distribution: Mediterranean Basin east to the Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

E. verticillata *Forsk.* Flor. Aegypt.-Arab. sive Descr. pl. Aeg. Arab. 210 (1775).

Between Lavra and its arsenal, 20.4.34, in macchia, no. 2511; Sithonia (Longos) Peninsula, near Armisti, 19.4.34, coll. *H. G. Chick* and *H. G. Tedd*, no. 2647.

Distribution: E. Mediterranean Basin; Mediterranean districts of the Balkan Peninsula.

PRIMULACEAE.

Anagallis arvensis L. Sp. Pl. 148 (1753) s.l.

South-east of Pyrgos, 24.4.34, bare stony ground by the sea, no. 2725, flowers vermilion-scarlet; Mulyani Islands, 13.4.34, no. 2599, flowers blue.

Distribution: Cosmopolitan; general in the Balkan Peninsula.

The nomenclature of the intra-specific phenotypes of *A. arvensis* has not yet been satisfactorily settled. No. 2599 is a variety with very broadly ovate leaves and rather blue large corollas, whose lobes are densely glandular at the margins.

Asterolinum linum-stellatum (L.) *Duby* in DC. Prodr. 8, 68 (1844).

Mulyani Islands, dry stony places, 15.4.34, No. 2382.

Distribution: Mediterranean Region and Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

Cyclamen neapolitanum *Ten.* Flor. Nap. 3, 197, t. 118 (1811-36).

Cultivated in the Herbarium Ground, Kew, 1934-36, in flower 3.10.35 and 17.9.36, as K 1392, from tubers collected between Simopetra and Karyes, 13.4.34.

The common autumn-flowering *Cyclamen* of Athos Peninsula has been identified as *C. graecum* Link in Linnaea 9, 573 (1825) by Boissier (Flor. Or. 4,

13 : 1875), and accepted as such by Pax (in Pflanzenr. iv. 237, 254 : 1905), and as *C. neapolitanum* Ten. by Toel and Rohlena (Sitz. k. böhm. Ges. Wiss. Prag. : 1902, p. 5 of separate) and by Bornmüller (in Engl. Bot. Jahrb. **61**, 13 : 1927).

The confusion is understandable as the two species are closely related and *C. neapolitanum* Ten. is decidedly polymorphic, especially in foliage characters. Moreover the Athos material, as seen in spring, has certain characters which are not regarded as typical for *C. neapolitanum* Ten. Thus, many of the leaves are not or are scarcely lobed, some are relatively large, and the leaf-margin is decidedly cartilaginous. A study of the living plants, flowered at Kew for two seasons from tubers collected on Athos Peninsula, and comparison with living flowering material of *C. neapolitanum* Ten. grown at Kew from tubers collected in Dalmatia, has shown that the identification of the Athos plant as *C. neapolitanum* Ten. must stand and there is no direct evidence known to the writer that *C. graecum* is distributed as far north as the Athos Peninsula.

Distribution : S. Europe ; fairly widely spread in the Balkan Peninsula, especially in the Mediterranean and Transitional districts.

PLUMBAGINACEAE.

***Armeria sancta* Janka** in Termesz. Füz. **6**, parte I-II., 2 (1882) e descr.

Near Stavronikita, 21.4.34, bare rocky slopes by the sea, no. 2561, flowers pink.

Distribution : Athos endemic.

Hayek's account, in Prodr. Penins. Flor. Balc. **2**, 13 (1928) is unsatisfactory. He describes the calyx as aristate whereas Janka says "calycis limbus subtruncatus, lobi latissimi brevissimi, aristae brevissimae mucroniformes, crassiusculae, incurvae." Further, Hayek gives the habitat as "in pascuis subalpinis et alpinis," whereas the type was "e rupibus maritimis pr coenobium Lavra ad ped. m. Athos."

***Limonium angustifolium* (Tausch) comb. nov.** *Statice angustifolia* Tausch in Syll. Ratisb. **2**, 254 (1828).

Mulyani Islands : Pontiko Island, Sept. 1934, *Mrs. Loch* no. 33.

Distribution : Mediterranean Basin, east to Caucasus ; most coastal districts of the Balkan Peninsula.

***L. Gmelini* (Willd.) O. Ktze.** Rev. Gen. **1**, 395 (1891).

Mulyani Islands : Pontiko Island, Sept. 1934, *Mrs. Loch* no. 15.

Distribution : E. Mediterranean Region ; southern and eastern districts of the Balkan Peninsula.

***L. sinuatum* (L.) Mill.** Gard. Dict. (1768).

Near Vatopedi, 12.7.34, sandy grassy places near the sea shore, *H. G. Tedd* no. 1531.

Flowers white, then mauve.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, Athos, Thrace, Thracian Islands.

OLEACEAE.

***Fraxinus Ornus* L.** Sp. Pl. 1057 (1753).

Kapsokalyvia, 19.4.34, dry slopes in macchia, no. 2484.

Flowers white.

Distribution : Mediterranean Basin and Pontic ; general in the Balkan Peninsula, but not in Crete.

***Olea europaea* L.** Sp. Pl. 8 (1753) subsp. *oleaster* (*Hoffm. et Lk.*) *Fiori* in Fiori e Paol. Flor. Anal. It. **2**, 338 (1902).

Head of Cassandra Gulf, 12.4.34, in macchia, nos. 2574 (large leaves), 2575 (small leaves).

O. europaea L. subsp. **sativa** (Hoffm. et Lk.) Fiori l.c.

S.-E. of Pyrgos, cultivated on bare ground near the sea, 24.4.34, no. 2745. Basal shoots prickly and with small leaves. Crown shoots without spines and with large leaves.

Distribution (of species): Mediterranean Region, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

Phillyrea media L. Sp. Pl. ed. 2, 10 (1762).

Head of Cassandra Gulf, 12.4.34, in macchia, no. 2595.

A very small-leaved variety or form.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

BORAGINACEAE.

Alkanna graeca Boiss. et Sprun. in Boiss. Diagn. 1, iv, 47 (1844).

Simopetra, between the arsenal and the monastery, 13.4.34, stony ground in macchia zone, no. 2286.

Corollas orange-yellow.

Distribution: Balkan Peninsular endemic; Greece, Epirus, S. Macedonia.

Much less glandular than in typical specimens of the species, and thus verging towards *A. boeotica* DC.

A. tinctoria (L.) Tsch. Flora 7, 1, 234 (1824).

Asbestochori Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2592.

Deep blue corollas.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

Anchusa italica Retz. Obs. 1, 12 (1779).

Near Stavronikita, 21.4.34, on stony ground, no. 2562.

Corollas deep blue.

Distribution: Mediterranean Region and the Caucasus; widespread in the Balkan Peninsula.

Anchusa officinalis L. Sp. Pl. 133 (1753) var. **moesiaca** (Vel.) Guşul. in Bull. Fac. Şt. Cern. 1, 102 (1927).

Hills beyond Pyrgos, June 1934, Mrs. Loch no. 26; between Dochiariou and Xenophontos, 18.4.34, in macchia zone on stony ground, no. 2503, corollas rich deep violet; Sithonia (Longos) Peninsula, near Armisti, 19.4.34, coll. H. G. Chick and H. G. Tedd, no. 2645.

Distribution (of species): General European, Mediterranean Region, Caucasus; widespread in the Balkan Peninsula, but not in Crete.

Cerinthe minor L. Sp. Pl. 137 (1753).

Near Kapsokalývia, 19.4.34, dry bushy slopes, on limestone, no. 2477.

Corolla lobes yellow, bronze below.

Distribution: Central Europe, Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

Cynoglossum creticum Mill. Gard. Dict. (1768).

Simopetra, between the arsenal and the monastery, 13.4.34, dry stony bank, no. 2348.

Distribution: Mediterranean Region; widespread in the Balkan Peninsula.

Echium plantagineum L. Mant. 2, 202 (1771).

Hills behind Pyrgos, June 1934, Mrs. Loch no. 27; above Simopetra, 13.4.34, stony dry open ground, no. 2340, violet-purple flowers; Mulyani Islands: small island off Pyrgos, 13.4.34, coll. H. G. Chick, no. 2626.

Distribution: Mediterranean Basin and east to the Caucasus; widespread in the Balkan Peninsula.

Heliotropium europaeum L. Sp. Pl. 130 (1753).

Pyrgos, among stones in the street, 25.4.34, no. 2758A.

Corollas white.

Distribution : Central Europe, Mediterranean Region, Caucasus ; general in the Balkan Peninsula.

H. suaveolens M. Bieb. Flor. Taur-Cauc. 3, 116 (1819).

Pyrgos, among stones in the street, 25.4.34, no. 2758.

Corollas white.

Distribution : Oriental, Pontic, Caucasus ; Cyclades, Thessaly, Albania, N. and S. Macedonia, Thrace, N. and S. Bulgaria, Rodope Massif, Dobruja.

Myosotis cadmea Boiss. Diagn. 1, xi. 122 (1849).

On high ridge from above Simopetra to Karyes, 13.4.34, semi-open places in woods, no. 2328.

Flowers large for the size of the plant ; corollas of an intense azure blue.

Distribution : E. Mediterranean Basin ; N. and S. Macedonia, Thrace, Rodope Massif.

M. collina Hoffm. Deutsch. Flor. ed. 1, 61 (1791).

Near Karyes, 13.4.34, grassy bank, no. 2372, pale blue flowers ; Mulyani Islands : small island off Pyrgos, 15.4.34, dampish place amongst brushwood, no. 2395.

Distribution : Central Europe, Mediterranean Region ; general in the Balkan Peninsula.

M. versicolor Sm. Engl. Bot. sub. t. 2558 (1814).

Cultivated in the Herbaceous Department, Kew, as 501/35, 13.2.36, from seeds collected near Pyrgos, Mrs. Loch.

Distribution : Central Europe ; Corfu, Serbia.

A form with few or no uncinat hairs on the calyx. Determined by Mr. A. E. Wade.

Onosma paradoxum Janka in Oesterr. Bot. Zeitschr. 22, 180 (1872).

O. Aucherianum DC. subsp. *pallidum* (Boiss.) Hayek var. *paradoxum* (Jka.) Hayek Prodr. 2, 86 (1928).

Kapsokalyvia, 19.4.34, limestone slopes above sea, no. 2489.

Pale yellow corollas.

Distribution : Athos endemic.

The locality of Janka's type is given (l.c.) as " in m. Athos regionis mediae pineto infra Panajia."

Symphytum bulbosum Schimp. in Flora 8, 17 (1825).

High up on the ridge above Karyes, from Simopetra, 13.4.34, in a rather damp semi-shady place in woods of *Castanea*, no. 2321.

Cream-coloured corollas.

Distribution : Central and S. Europe ; Greece, Thessaly, Corfu, N. and S. Macedonia, Thrace, N. and S. Bulgaria, Rodope Massif, Dalmatia, Istria.

S. ottomanum Friv. in Flora 19, 439 (1836).

Sithonia (Longos) Peninsula, near Armisti, 19.4.34, coll. H. G. Chick and H. G. Tedd, no. 2646 ; in Karyes, under a wall by a path-side, 14.4.34, no. 2275.

White corollas with protruding stamens. A tall plant.

Distribution : Balkan Peninsular type, north to Banat ; Greece, Thessaly, Epirus, N. and S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif.

CONVOLVULACEAE.

Convolvulus elegantissimus Mill. Gard. Dict. ed. 8 (1768).

Simopetra, between the arsenal and the monastery, 13.4.34, dry stony ground, no. 2351.

Distribution : Mediterranean Basin ; Mediterranean and Transitional districts of Balkan Peninsula.

SOLANACEAE.

***Hyoscyamus albus* L. Sp. Pl. 180 (1753).**

Cultivated in the Herbarium Ground, Kew, 20.8.35 and 11.35 (fruit), as K. 1464, from seeds collected at Isphigmenou, 22.4.34.

Distribution: Mediterranean Region; Mediterranean and Transitional districts of the Balkan Peninsula.

SCROPHULARIACEAE.

***Antirrhinum Orontium* L. Sp. Pl. 617 (1753).**

Simopetra, above the arsenal, 13.4.34, no. 2368.

Pink corollas.

Distribution: E. N. Temperate Region; widespread in the Balkan Peninsula.

***Bellardia Trixago* (L.) All. Flor. Peden 1, 61 (1785). *Trixago apula* Stev. Mem. Soc. Nat. Mosc. 6, 4 (1823) n.v.**

Hills behind Pyrgos, 15.6.34, Mrs. Loch no. 8; near Chilandari, 22.4.34, sandy fields near the sea, no. 2679.

Corollas pink and white.

Distribution: Mediterranean Region, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

***Linaria genistifolia* Mill. Gard. Dict. ed. 8 (1768).**

Mt. Athos, flowers all the summer, 1934, F. S. Loch no. 32.

Height of bush 2 ft.

Distribution: E. N. Temperate Region; Thessaly, Albania, N. and S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif, Dobruja, Serbia, S. Croatia.

***L. pelisseriana* (L.) Mill. Gard. Dict. ed. 8 (1768).**

Mulyani Islands: small island opposite Pyrgos, 13.4.34, coll. H. G. Chick, no. 2633.

Purple corollas.

Distribution: Mediterranean Basin east to the Caucasus; widespread in the Balkan Peninsula.

***Parentucellia latifolia* (L.) Car. in Parl. Flor. It. 6, 480 (1885).**

Near Xerxes Canal, 17.4.34, bare patches on grassy ground, no. 2445.

Distribution: Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

***Scrophularia heterophylla* Willd. Sp. Pl. 3, 274 (1801) subsp. *laciniata* (W. et K.) Maire et Petitm. var. *variegata* (Reichb.) Hayek Prodr. 2, 152 (1929).**

Simopetra, between the monastery and the arsenal, 14.4.34, stony banks, no. 2296.

Corollas chocolate-purple.

Distribution (of species): E. Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

***S. peregrina* L. Sp. Pl. 621 (1753).**

Simopetra, between the monastery and the arsenal, 13.4.34, stony ground no. 2358. A robust branched form.

Distribution: Mediterranean Region; Mediterranean and Transitional districts of the Balkan Peninsula.

***Verbascum banaticum* Roch. ap. Schrad. Mon. Verb. 2, 28 (1823).**

South-east of Pyrgos, 24.4.34, on *Cistus*-clad slopes, no. 2726; cultivated in the Director's Garden, Kew, 1936, from seeds sent by Mrs. Loch.

Flowers yellow, filament hairs white. Plants up to 2 m. high. One of the species called "Phlomos" and used for fish poisoning.

Distribution: Pannonian; Thessaly, Epirus, Albania, N. and S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif, Dobruja, Serbia.

V. phoeniceum L. Sp. Pl. 178 (1753).

Near Xerxes Canal, 17.4.34, on bare ground, no. 2447.

Distribution: E. N. Temperate Region; widespread in the Balkan Peninsula, except Greece and Crete.

Veronica Anagallis-aquatica L. Sp. Pl. 12 (1753).

Hills behind Pyrgos, 6.34, *Mrs. Loch* no. 24.

Distribution: Cosmopolitan; general in the Balkan Peninsula.

V. arvensis L. Sp. Pl. 13 (1753).

Near Chilandari, 22.4.34, on walls, no. 2671.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

V. Chamaedrys L. Sp. Pl. 13 (1753) var. **pilosa** (*Schm.*) *Benth.* in DC. Prodr. 10, 475 (1846).

Above Simopetra, on way to Karyes, 600 m., 13.4.34, in *Castanea* woods in half-shade, no. 2329, a large-flowered form with pale blue corollas; S. E. of Pyrgos, in ravine, 14.4.34, coll. *H. G. Chick*, no. 2604.

Distribution (of species): E. N. Temperate Region; general in the Balkan Peninsula, but not Crete.

V. Cymbalaria *Bod.* Mem. 3, ex Bertol. *Amoen. Ital.* 56 (1892).

Simopetra, between the monastery and the arsenal, 13.4.34, no. 2290, abundant, corollas white; cultivated in the Herbarium Ground, Kew, from seeds collected near Simopetra, 13.4.34, as K.1456, 1478, 1491, 20.6.35, 5.7.35, and 13.7.35.

Distribution: Mediterranean Basin; widespread in the Balkan Peninsula.

V. hederifolia L. Sp. Pl. 13 (1753).

Cultivated in the Herbarium Ground, Kew, 2.5.35 and 20.6.35, as K.1444, from seeds collected near Chilandari Arsenal, 22.4.34.

Distribution: General European, Mediterranean Region, Caucasus; general in the Balkan Peninsula.

OROBANCHACEAE.

Orobanche caryophyllacea *Sm.* Trans. Linn. Soc. 4, 169 (1798).

Between Pyrgos and Xerxes Canal, 17.4.34, stony places in depauperated macchia, no. 2435, corollas mauve outside, yellowish within, stigma dark brick red; no. 2435A, a form or variety with pale-coloured corollas.

With the odour of cloves. Appeared to be parasitic on grasses.

Distribution: Central and S. E. Europe and Caucasus; widespread in the Balkan Peninsula, but not in Crete.

O. Grisebachii *Reut.* in DC. Prodr. 11, 28 (1847).

Hills behind Pyrgos, 15.6.34, *Mrs. Loch* no. 7.

Distribution: Oriental; Crete, Greece, Athos Peninsula.

O. lavandulacea *Reichb.* Pl. Crit. 7, 48, f. 935 (1829).

Near Kapsokalývia, 19.4.34, among stones on hot dry limestone slopes, no. 2475.

Parasitic on *Psoralea*. Corollas deep bluish-mauve.

Distribution: Mediterranean Basin; Crete, Greece, Corfu, Dalmatia.

O. minor *Sutt.* in Trans. Linn. Soc. 4, 179 (1798).

Near Pyrgos, 1934, coll. *H. G. Chick*, comm. *Mrs. Loch* no. 37, a variety or form with strongly pilose-glandular corollas; Mulyani Islands: small island opposite Pyrgos, 25.4.34, no. 2759, parasitic on *Hypericum* sp., stigma dark mauve, corolla whitish mauve within, darker without, no odour of cloves.

Distribution: N. Temperate Region; widespread in the Balkan Peninsula, but not in Crete.

O. minor *Sutt.* forma (vel. var. ?) **minima** *Beck* in Bibl. Bot. Heft 19, 252 (1890).

Hills behind Pyrgos, 6.34, *Mrs. Loch* no. 25.

O. Muteli *F. Schultz* in *Mutel Flor. Fr.* 2, 353 (1835).

Above Simopetra, 14.4.34, stony ground, no. 2334, parasitic on *Calendula* or grass; below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2425, pale lavender corollas, parasitic on *Calendula*.

Distribution: Mediterranean Region, Dacian, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

O. nana *Noë* ex *Reut.* in *DC. Prodr.* 11, 9 (1847).

Mulyani Islands: second small island off Pyrgos, 15.4.34, coll. *H. G. Chick*, no. 2404.

Distribution: Mediterranean Region and Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula, but not Crete.

O. ramosa *L. Sp. Pl.* 633 (1753).

Hills behind Pyrgos, 15.6.34, *Mrs. Loch* no. 6.

Distribution: Central Europe and Mediterranean Basin; widespread in the Balkan Peninsula.

O. reticulata *Wallr. Orob. gen. διασκ.* 42 (1825).

Mt. Athos peak, 1900 m., 12.7.34, crevices of stones, etc., on rocky hillside, *H. G. Tedd* no. 1484.

Corollas yellowish, with pink streaks; stigma red.

Distribution: Central and S. E. Europe; Greece, Albania, S. Macedonia, Athos Peninsula, N. Bulgaria, Rodope Massif, Dobruja, Serbia, Montenegro, Bosnia, Hercegovina.

SELAGINACEAE.

Globularia Alypum *L. Sp. Pl.* 95 (1753).

Near the end of the Gulf of Cassandra, 12.4.34, forming colonies in depauperated macchia, no. 2594.

Bluish-mauve flowers.

Distribution: Mediterranean Basin; Crete, Greece, Cyclades, S. Macedonia.

LABIATAE.

Ajuga Chamaepitys (*L.*) *Schreb. Pl. Unilab. p.* xxiii. (1774) var. **grandiflora** *Vis. Flor. Dalm.* 2, 222 (1847).

Below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2419.

Distribution: Central Europe, Mediterranean Region, Caucasus; general in the Balkan Peninsula, but not in Crete.

Calamintha alpina (*L.*) *Lam. Flor. Fr.* 2, 394 (1778) var. **granatensis** (*Boiss. et Reut.*) *Hal. Consp.* 2, 544 (1902).

Mt. Athos peak, 1550–1900 m., 12.7.34, rocks on stony path, etc., *H. G. Tedd* no. 1520.

Prostrate habit, corollas dark violet-purple.

Distribution (of species): S. European mountains, Central Europe; widespread in the Balkan Peninsula.

The variations of *C. alpina*, and the separation of this species from neighbouring species, have perplexed taxonomists. *Tedd's* material from Mt. Athos fits into the var. *granatensis* in the sense of *Briquet's* description in *Flor. des Alpes maritimes* 450 (1895), except that it has somewhat smaller more rounded leaves. With the advent of more material of *C. alpina* from the Balkan Peninsula it may be found advisable to give the Athos plant a distinctive name. It should, however, be noted that morphological intermediates occur between the extreme Athos type and the Spanish original, especially in Greece.

C. vulgaris (*L.*) *Druce* in *Ann. Scot. Nat. Hist.* 1906, 224.

Grown in the Herbarium Ground, Kew, 8.8.34, as K.1443, from previous year's seeds collected near Zographu Arsenal, 16.4.34.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

Lamium bifidum Cyr. Pl. Rar. Neap. 1, p. xxii (1788).

Above Simopetra, on the way to Karyes, 13.4.34, high up in the woods, no. 2304.

Corollas white. Leaves generally with a white blotch.

Distribution : Italy ; Mediterranean and Transitional districts of the Balkan Peninsula.

L. garganicum L. Sp. Pl. ed. 2, 808 (1763) var. **glabratum** Griseb. Spic. 2, 133 (1844).

Simopetra, between the monastery and the arsenal, 13.4.34, no. 2359.

Purplish-pink flowers.

Distribution (of species) : Italy, Greece, Thessaly, Albania, N. Macedonia, Thrace, N. Bulgaria, Serbia.

L. maculatum L. Sp. Pl. ed. 2, 809 (1753) var. **echinatum** Griseb. Spic. 2, 134 (1844).

Above Karyes, 13.4.34, woods and banks in semi-shade, no. 2306.

Corollas purple. With or without a white blotch to the leaves.

Distribution (of species) : General European, Pontic, Caucasus ; widespread in the Balkan Peninsula, but not in Crete.

L. striatum S. et S. Prodr. 1, 405 (1806) var. **glabratum** Griseb. Spic. 2, 133 (1844).

Above Karyes, 14.4.34, shady places in woods, no. 2307.

Large white corollas. No white blotch on the leaves.

Distribution (of species) : E. Mediterranean Basin ; Crete, Greece, Epirus, Albania, N. and S. Macedonia, Athos Peninsula, Thracian Islands.

Mentha Pulegium L. Sp. Pl. 577 (1753) var. **subtomentella** H. Br. var. **hirsuta** (Pér. in Bull. Soc. Bot. Fr. 17, 203 : 1870, as *Pulegium vulgare* Mill. forma *hirsutum*) Briq. Lab. des Alpes marit. 94 (1891).

Pyrgos, sea-level, 24.7.34, Mrs. Loch no. 31.

Distribution (of species) : E. N. Temperate Region ; general in the Balkan Peninsula.

Micromeria Juliana Benth. Lab. 373 (1834).

Cultivated in the Herbarium Ground, Kew, 20.4.35, as K.1465, from seeds collected above Zographu Arsenal, 16.4.34.

Distribution : E. Mediterranean Basin ; widespread in the Balkan Peninsula.

Nepeta Sibthorpii Benth. Lab. 474 (1834).

Mt. Athos peak, near Panaghia, 1500–1550 m., 12.7.34, waste stony and rocky places, H. G. Tedd no. 1528.

Corollas yellowish white ; the plants have a pungent odour.

Distribution : Balkan Peninsula endemic ; Greece.

Origanum hirtum Link Enum. 2, 114 (1822).

Grown in the Herbarium Ground, Kew, 8.8.35, as K.1396, from seeds collected above Zographu monastery, 16.4.34.

Distribution : E. Mediterranean Basin ; widespread in the Balkan Peninsula.

Phlomis samia L. Sp. Pl. 585 (1753).

Mt. Athos peak, 920–1550 m., 12.7.34, waste stony places, H. G. Tedd no. 1527.

Corollas brownish-red ; plant about 1 m. high.

Distribution : E. Mediterranean Basin ; Greece, Thessaly, S. Macedonia, Athos Peninsula.

Prasium majus L. Sp. Pl. 601 (1753).

Mulyani Islands : one of the smaller islands off Pyrgos, 15.4.34, dampish places in brushwood, coll. H. G. Chick, no. 2392.

Distribution : Mediterranean Basin ; Mediterranean and Transitional districts of the Balkan Peninsula.

Rosmarinus officinalis L. Sp. Pl. 23 (1753).

Panteleémon, 14.4.34, on the walls of the monastery, no. 2264.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

Salvia clandestina L. Sp. Pl. ed. 2, 36 (1762).

Near the Russian skete, E. of Pyrgos, 23.4.34, on stony ground, no. 2708. Corollas blue.

Distribution: Mediterranean Region; Mediterranean and Transitional districts of the Balkan Peninsula.

The material approximates to the var. *multifida* (S. et S. Prodr. 1, 16: 1806 pro sp.).

Salvia triloba L. fil. Suppl. 88 (1781).

Between Dochiariou and Xenophontos, 18.4.34, stony and rocky sunny open slope in macchia zone, no. 2502, flowers rather pale mauve; cultivated at Iviron, 20.4.34, no. 2546, grown in the monastery garden but said to have come from high up on Mt. Athos. The leaves and young shoots are used for making a tea infusion.

Distribution: Italy, Sicily, E. Mediterranean Region; Crete, Greece, Cyclades, Corfu, Thrace, Hercegovina.

S. Verbenaca L. Sp. Pl. 25 (1753).

Near the Russian skete, E. of Pyrgos, 23.4.34, on stony ground, no. 2707. Corollas deep mauve.

Distribution: W. Europe, Mediterranean Region, Caucasus; general in the Balkan Peninsula.

S. viridis L. Sp. Pl. 24 (1753).

Between Pyrgos and Xerxes Canal, 17.4.34, bare slopes below macchia, near the sea, no. 2458.

Corollas bluish-mauve.

Distribution: Mediterranean Basin, Pontic, Caucasus; Crete, Greece, Cyclades, Corfu, N. and S. Macedonia, Thrace, Dalmatia.

Scutellaria albida L. Mant. altera 248 (1771).

Near Kapsokalývia, 19.4.34, dry bushy limestone slopes, no. 2485, corollas with lower lip nearly white, otherwise purplish-red; Mt. Athos peak, 1900m., 12.7.34, rocks, *H. G. Tedd* no. 1515.

Distribution: E. Mediterranean district, Banat, Caucasus; fairly widespread in the Balkan Peninsula, but not in Crete.

Sideritis romana L. Sp. Pl. 575 (1753).

Near Chilandari, 22.4.34, on walls, no. 2677.

Corollas white.

Distribution: Mediterranean Basin; Montenegro, Hercegovina, Dalmatia, S. Croatia, Istria.

Stachys arvensis L. Sp. Pl. ed. 2, 814 (1763).

Near Stavronikita, towards Pantokratoros, 21.4.34, in macchia on mica-schist slopes, on bare ground, no. 2552.

Distribution: General European; Crete, Greece, Corfu, Albania, N. Bulgaria, Dalmatia, S. Croatia.

Stachys cassia Boiss. Diagn. 1, xii 76 (1853) var. *athoa* Hal. ex Hayek Prodr. 2, 285 (1929).

Hills behind Pyrgos, 6.34, *Mrs. Loch* no. 28.

Distribution (of species): E. Mediterranean Basin; Greece, Thessaly, N. and S. Macedonia, Athos Peninsula, Thrace, S. Bulgaria, Rodope Massif, Serbia, Dalmatia.

Teucrium montanum L. Sp. Pl. 565 (1753).

Mt. Athos peak, 1900 m., 12.7.34, rocks and rock crevices, *H. G. Tedd* no. 1498.

Corollas light yellow.

Distribution : E. N. Temperate Region ; general in the Balkan Peninsula, but not in Crete.

Thymus heterotrichus Griseb. Spic. 2, 116 (1844).

Above Simopetra, on way to Karyes, 13.4.34, dry strong ground, no. 2339.

Very pale mauve corollas.

Distribution : Balkan Peninsular type ; Thessaly, N. and S. Macedonia, Athos Peninsula, N. and S. Macedonia, Rodope Massif, Serbia.

T. Jankae Čel. in Flora 66, 147 (1883) var. **robustior** Vel. Rel. Mrkv. 25 (1922) x **T. ocheus** Heldr. et Sart. ?

Mt. Athos peak (Panaghia), 1550 m., 12.7.34, rocks and stony slopes, H. G. Tedd no. 1500.

The specimens have very strong woody bases. The two suggested parents grow, apparently in close proximity, on Athos peak.

T. ocheus Heldr. et Sart. in Boiss. Diagn. 2, iv 6 (1859).

Mt. Athos peak (Panaghia), 1500 m., 12.7.34, stony places, H. G. Tedd no. 1509.

Corollas bright pink. The specimens are remarkable for the crowded lower leaves of the flowering branches, these leaves being smaller than those immediately below the inflorescences. The flowering stems and middle and upper leaves are very densely clothed with white hairs. It is possible that this is a distinct subspecies or variety from the type plant from Euboea.

Distribution : Balkan Peninsular endemic ; Greece, N. and S. Bulgaria, Athos Peninsula, Rodope Massif.

T. Toševii Vel. in Sitz. Böhm. Ges. Wiss. 1903, 15.

Mt. Athos peak, Panaghia, 1550 m., 12.7.34, rocks, H. G. Tedd no. 1510.

Distribution. Balkan Peninsular endemic ; Thessaly, N. and S. Macedonia, N. and S. Bulgaria, Serbia.

The specimens appear to come near to var. *Degenii* (H. Br.) Ronn. and to var. *Turrillii* Ronn. The latter is known only from Mt. Vitoša in Bulgaria.

PLANTAGINACEAE.

Plantago Bellardi All. Flor. Pedem. 1, 82, t. 85 (1785).

Near Pyrgos, bare ground in macchia, 17.4.34, no. 2450.

Distribution : Mediterranean Region ; Mediterranean and Transitional districts of the Balkan Peninsula.

P. Coronopus L. Sp. Pl. 115 (1753).

Mulyani Islands : Pontiko Island, 15.4.34, dry stony places, no. 2386.

Distribution : Central Europe and Mediterranean Region ; widespread in the Balkan Peninsula, especially in the coastal districts.

P. Lagopus L. Sp. Pl. 114 (1753).

Between Pyrgos and Xerxes Canal, 17.4.34, grassy ground near the shore, no. 2452.

This is a very small form or variety growing in poor soil.

Distribution : Mediterranean Region and Caucasus ; Mediterranean and Transitional districts of the Balkan Peninsula.

ILLECEBRACEAE.

Herniaria hirsuta L. Sp. Pl. 218 (1753).

Mulyani Islands : Pontiko Island, 15.4.34, dry stony places, no. 2387.

Distribution : Old World ; general in the Balkan Peninsula.

Scleranthus dichotomus Schur in Verh. Siebenb. Ver. Naturw. 2, 10 (1851).

South-east of Pyrgos, 23.4.34, stony ground in macchia, no. 2711.

With rather long slender leaves and relatively large young flowers.

Distribution : S. Europe ; N. and S. Macedonia, N. and S. Bulgaria, Dobruja, Serbia.

POLYGONACEAE.

Polygonum Kitaibeliana *Sadl.* Flor. Pest. 1, 287 (1825).

Pyrgos, 10.12.34, *Mrs. Loch* no. 21.

Distribution : N. Temperate Region ; widespread in the Balkan Peninsula, but not in Crete.

Rumex Acetosella *L.* Sp. Pl. 338 (1753) approximating to the var. **multifidus** (*L.*) DC. Flor. Fr. 3, 378 (1805).

High above Karyes, 13.4.34, No. 2282A.

The leaves on the young shoots range from simple to hastate with simple or once divided basal lobes.

Distribution (of species) : cosmopolitan ; general in the Balkan Peninsula.

ARISTOLOCHIACEAE.

Aristolochia pallida *Willd.* Sp. Pl. 4, 162 (1805).

Near Iveron, 20.4.34, edge of macchia, no. 2544.

Pale brown perianth with greenish tube and chocolate colour inside the throat.

Distribution : Mediterranean Basin ; Mediterranean and Transitional districts of the Balkan Peninsula, but not in Crete.

A. rotunda *L.* Sp. Pl. 962 (1753).

Sithonia (Longos) Peninsula, near Armisti, 19.4.34, coll. *H. G. Chick* and *H. G. Tedd*, no. 2650.

Distribution : Mediterranean Basin ; Mediterranean and Transitional districts of the Balkan Peninsula.

CYTINACEAE.

Cytinus Hypocistis *L.* Syst. ed. 12, 2, 602 (1767) var. **kermesinus** *Guss.* Flor. Sic. Syn. 2, 619 (1844).

Between Chilandari and Pyrgos, 23.4.34, parasitic on *Cistus* sp., in macchia under *Pinus halepensis* *L.*

Distribution : Mediterranean districts of the Balkan Peninsula.

EUPHORBIACEAE.

Euphorbia acanthothamnus *Heldr. et. Sart.* in Boiss. Diagn. 2, iv. 86 (1859).

Kapsokalývia, 19.4.34, dry limestone slopes, No. 2482.

Spiny plants, forming large rounded bushes, with strong unpleasant odour when in flower.

Distribution : E. Mediterranean Basin ; Crete, Greece, Cyclades, Corfu, S. Macedonia, Athos Peninsula.

E. amygdaloides *L.* Sp. Pl. 463 (1753).

Above Karyes, c. 650 m., 14.4.34, in *Castanea* woods, no. 2273.

Distribution : Central Europe, Mediterranean Region, Caucasus ; general in the Balkan Peninsula north of Greece.

E. Apios *L.* Sp. Pl. 457 (1753).

Asbestochori Cemetery, north of Salonika, 11.4.34, grassy places, no. 2584 ; above Panteleïmon, 14.4.34, dry bank in woods, no. 2268.

Distribution : E. Mediterranean Basin ; Crete, Greece, Thessaly, S. Macedonia, Athos Peninsula, Thrace, S. Bulgaria, Rodope Massif.

E. dendroides *L.* Sp. Pl. 462 (1753).

East of Kapsokalývia, 19.4.34, dry bushy slopes, on crystalline limestone, no. 2477, floral leaves yellow, lobes yellow and bronze below ; near Dionysiou, 18.4.34, half-open places in macchia, in clefts of rocks, no. 2464.

A tall branched plant, with woody stems up to 4 cm. in diameter.

Distribution : Mediterranean Basin ; Crete, Greece, Cyclades, Corfu, Albania, Montenegro, Dalmatia.

E. graeca Boiss. et Sprun. in Boiss. Diagn. 1, v, 53 (1844).

Zographu, 16.4.34, bare stony ground in high macchia. no. 2407; south-east of Pyrgos, 24.4.34, on slopes between bushes of *Cistus*, no. 2722.

No. 2407 is a very interesting plant which is placed under *E. graeca* with some hesitation. While it agrees well with typical specimens of the species in important diagnostic characters, its habit appears very different. It is suffruticose, with many long slender branches arising from the base.

Distribution: Oriental, Caucasus; widespread in the Balkan Peninsula.

E. Helioscopia L. Sp. Pl. 459 (1753).

Plants cultivated in the Herbarium Ground, Kew, 9.8.35, as K. 1489, from seeds collected above Simopetra, 13.4.34; above Simopetra, c. 190 m., 13.4.34, stony ground among Mediterranean hill-flora, no. 2336; an interesting form or variety with red stems, branched from the base, fruits glabrous.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

E. oblongata Griseb. Spic. 1, 136 (1843).

Between Stavronikita and Pantokratoros, 21.4.34, no. 2557. From the type locality of Grisebach. Abundant in the macchie and in open places on mica-schist. Bracts yellow, scales entire, ovary verrucose.

Distribution: Balkan Peninsular endemic; Crete, Greece, Cyclades, Thessaly, Epirus, S. Macedonia, Athos Peninsula, Thrace, S. Bulgaria, Rodope Massif.

E. Peplis L. Sp. Pl. 455 (1753).

Mulyani Islands, on sand-bar near sea-level, 20.4.34, Mrs. Loch no. 11.

Distribution: W. Europe, Mediterranean Basin, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

E. veneta Willd. Enum. Pl. Hort. Berol. 507 (1809).

Simopetra, between the arsenal and the monastery, 14.4.34, in macchia, in more open parts on rocky stony ground, no. 2284.

Large clumps with thick stems.

Distribution: N. E. Italy; Greece, Thessaly, Albania, S. Macedonia, Thrace, Montenegro, Hercegovina, Dalmatia, S. Croatia, Istria.

There seems to be no constant morphological differences between this species and *E. Sibthorpii* Boiss. Cent. Euph. 39 (1860). Hayek (Prodr. 1, 129: 1924) reduces *E. Sibthorpii* to a variety of *E. veneta*, but the differential characters relied upon by him and by Halácsy (Consp. Flor. Graec. 3, 104: 1904, as species) are not exhibited by the extensive series of specimens at Kew. The leaves, the involucre lobes, and the glands (the last two seen on dissection) show only individual fluctuations. Thus *E. veneta* from the type area has bifid involucre scales.

LAURACEAE.

Laurus nobilis L. Sp. Pl. 369 (1753).

Above Panteleimon, 14.4.34, in high macchia, no. 2269.

Distribution: Mediterranean Region, Caucasus; Mediterranean districts of the Balkan Peninsula.

THYMELAEACEAE.

Daphne Laureola L. Sp. Pl. 357 (1753).

Above Karyes, 14.4.34, in *Castanea* woods, no. 2274.

Distribution: Central Europe; Greece, Thessaly, N. and S. Macedonia, Serbia, Bosnia, S. Croatia, Istria.

D. oleoides Schreb. var. *glandulosa* (Bertol.) Keissl. in Engl. Bot. Jahrb. 25, 49 (1898).

Mt. Athos peak, 12.7.34, 1700 m., rocky places and rock crevices, H. G. Tedd no. 1492.

Perianths white, fruits red; small bushy shrub.

Distribution (of species): Mediterranean Region, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

LORANTHACEAE.

Viscum laxum Boiss. et Reut. Diagn. Pl. Hisp. 16 (1842) var. *Abietis* (Wiesb.) Hayek Flor. Steierm. 1, 188 (1908).

High above Simopetra, on way to Karyes, 13.4.34, no. 2301, parasitic on *Abies* no. 2302.

Distribution (of species): E. N. Temperate Region; Crete, Greece, Thessaly, S. Macedonia, Bosnia, Hercegovina, S. Croatia.

URTICACEAE.

Parietaria cretica L. Sp. Pl. 1052 (1753).

Mulyani Islands: small island opposite Pyrgos, 13.4.34, amongst rocks, coll H. G. Chick, no. 2600.

Distribution: Linosa; Crete, Greece, Cyclades.

The identification is not quite certain since the specimens are small and depauperated and the flowers are young.

P. lusitanica L. Sp. Pl. 1052 (1753).

Chilandari, on walls, 22.4.34, no. 2670.

Distribution: Mediterranean Basin east to Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

P. vulgaris Hill Brit. Herb. 491 (1756) see Druce in B.E.C. 1913 Rep. 439 (1934). *P. ramiflora* Moench Meth. 327 (1794).

Near Vatopedi, 22.4.34, on walls, no. 2668.

Distribution: Central Europe, Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

PLATANACEAE.

Platanus orientalis L. Sp. Pl. 999 (1753).

Near Chilandari Arsenal, 22.4.34, abundant and forming the dominant species of a wood in a dry stream bed, no. 2683; fruits collected above Pantelemon, 14.4.34, as K.1451 and in dry stream beds near Chilandari Arsenal, 22.4.34, as K.1485; seedlings from K.1485 cultivated in the Herbarium Ground, Kew, 19.7.35.

Distribution: Oriental; southern and Transitional districts of the Balkan Peninsula.

CUPULIFERAE.

Ostrya carpinifolia Scop. Flor. Carn. ed. 2, 2, 244 (1772).

Above Lavra, 620 m., in woods, 20.4.34, in woods in *Abies* zone, no. 2520.

Distribution: Central Europe, Oriental, Caucasus; general in the Balkan Peninsula, not in Crete.

Quercus coccifera L. Sp. Pl. 995 (1753).

Near Chilandari, 22.4.34, in macchia, no. 2678, small tree, 5 m. high; Mulyani Islands: small island off Pyrgos, 15.4.34, with Kermes galls and male flowers, no. 2768.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

Q. conferta Kit. in Schult. Öst. Flor. ed. 2, 1, 619 (1814).

Near Chilandari, 23.4.34, tree in macchia, no. 2696.

Distribution: Balkan Peninsular type; widespread in the Balkan Peninsula, but not in Crete.

Q. ilex L. Sp. Pl. 995 (1753).

Below Zographu Monastery, 16.4.34, tree in macchia, no. 2420.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

Q. lanuginosa (Lam.) Thuill. Flor. Par. ed. 2, 502 (1799).

Above Pantelemon, 14.4.34, in woods near the higher limit of the macchie, no. 2270.

Distribution: Central Europe, Mediterranean Basin east to Caucasus; general in the Balkan Peninsula.

SALICACEAE.

Populus nigra L. Sp. Pl. 1034 (1753) var. **italica** *Duroi* Harbk. Baumz. 2, 141 (1772); Hayek Prodr. 1, 81 (1924)?

Between Chilandari and Pyrgos, 23.4.34, on the plateau, no. 2688.

Greek name "Leuke." Grey-white trunk. A tall fastigate female tree.

Distribution (of species): N. Temperate Region; widespread in the Balkan Peninsula.

Houtzagers: Het Gaslacht *Populus*, 52, 224 (1937) would apparently consider this *P. nigra* var. *typica* ♀ × *P. nigra* var. *italica* ♂.

Salix alba L. Sp. Pl. 1021 (1753).

Near Chilandari Arsenal, 22.4.34, in dry stream bed, no. 2685.

Distribution: N. Temperate Region; general in the Balkan Peninsula.

ORCHIDACEAE.

Cephalanthera longifolia (L.) *Fritsch* in Oesterr. Bot. Zeitschr. 38, 81 (1888).

Near Zographu Arsenal, 16.4.34, stony ground, no. 2416.

Distribution: E. N. Temperate Region; widespread in the Balkan Peninsula, but not in Crete.

Neotinea intacta (Lk.) *Reichb.* De poll. Orch. 29 (1852).

Hills behind Pyrgos, 11.4.34, in macchia, coll. H. G. Chick, no. 2668.

White flowers.

Distribution: W. Europe and Mediterranean Basin; Crete, Greece, Thessaly, Corfu, Dalmatia.

Ophrys lutea Cav. Icon. 2, 46, t. 160 (1793) var. **minor** Parl. Flor. It. 3, 558 (1858).

Near Pyrgos, 1934, Mrs. Loch no. 29.

Distribution (of species): Mediterranean Basin; Mediterranean districts of the Balkan Peninsula.

O. Reynholdii H. *Fleischm.* in Osterr. Bot. Zeitschr. 57, 5, t. III (1907).

Near Chilandari Arsenal, 22.4.34, sandy field, in shade of brushwood, no. 2686.

Sepals pink; two white patches on labellum which was seal-skin chocolate in colour.

Distribution: This interesting species was described originally from Corfu and Mt. Hymettus, Greece. According to Keller and Soó in Keller und Schlechter, Monogr. und Iconogr. Orchid. Eur. Mittelmeergeb. 2, 60 (1931), Renz in 1929 found it on Mt. Prophet Elias, Rhodes.

Orchis laxiflora Lam. Flor. Fr. 3, 504 (1778).

Near Xerxes Canal, 17.4.34, damp ground, on the site of the Canal, no. 2437.

Flowers dark red-purple.

Distribution: Central Europe, Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

O. Morio L. Sp. Pl. 940 (1753) subsp. **picta** (Lois.) *Asch. et Graebn.* Syn. Flor. Mitt.-Eur. 3, 667 (1907).

Sithonia (Longos) Peninsula, 19.4.34, coll. H. G. Chick and H. G. Tedd, no. 2622.

Distribution (of species): E. N. Temperate Region; general in the Balkan Peninsula, but not in Crete.

O. provincialis Balb. Misc. alt. 33 (1806).

Near Zographu Arsenal, 16.4.34, no. 2412.

Flowers cream. Labellum with reddish-brown spots in two or three longitudinal lines. Leaves spotted.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

O. quadripunctata Cyr. in Ten. Pr. flor. Nap. LIII (1811-15).

Between Kapsokalyvia and Lavra, 19.4.34, dry slopes in macchia, no. 2479.

Flowers rose-purple, labellum trilobed with a few spots at base. Leaves spotted.

Distribution: Mediterranean Basin; Mediterranean and Transitional districts of the Balkan Peninsula.

O. romana Seb. Roman. Plant. fasc. 1, 12 (1813) var. floribus purpureis.

High above Karyes, 700 m., 13.4.34, in open bushy ground on top of the ridge, no. 2281.

Deep purple flowers. This is the so-called *lusus tenuifolia* (C. Koch) Soó in Fedde Rep. 24, 30 (1927) and Bot. Archiv. 23, 62 (1928).

O. romana Seb. var. floribus luteis.

Growing with the last, no. 2280.

Flowers very pale yellow and not spotted. This is the so-called *lusus flavescens* (C. Koch) Soó. l.c.

Distribution (of species): Mediterranean Region; Greece, N. and S. Macedonia, Thrace, N. Bulgaria, Rodope Massif, Serbia, Dalmatia.

O. Simia Lam. Flor. Fr. 3, 507 (1778).

Above the Roumanian Prodomos Skete, 19.4.34, dry bushy slopes, not limestone, no. 2494.

Distribution: General European, Oriental, Caucasus; fairly widespread in the Balkan Peninsula.

O. tridentata Scop. Flor. Carn. ed. 2, 2, 190 (1772).

Between Kapsokalyvia and Lavra, 19.4.34, dry slopes in macchia, no. 2481.

Distribution: Central Europe, Mediterranean Basin east to Caucasus; widespread in the Balkan Peninsula.

Serapias laxiflora Chaub. in Chaub. et Bory Flor. Pelop. 62 (1838).

On plateau between Chilandari and Pyrgos, 23.4.34, in grassland, no. 2690.

Distribution: Mediterranean Basin; Crete, Greece, Thessaly, Thrace, Istria.

S. vomeracea (Burm.) Briqu. Prodr. Flor. Cors. 1, 378 (1910).

Near Iviron, 20.4.34, bare ground in macchia zone, no. 2545.

Flowers deep brick-red.

Distribution: Mediterranean Region; Mediterranean and Transitional districts of the Balkan Peninsula.

AMARYLLIDACEAE.

Galanthus nivalis L. Sp. Pl. 288 (1753).

Slopes of Mt. Athos. on eastern side, high above Lavra, 800 m., 20.4.34, stony places in shade in *Abies* forest, no. 2526.

The plants are tall, with long leaves and large flowers. On the characters given by Hayek (Prodr. 3, 101: 1932) it is to be placed under the var. *maior* Ten. A bulb is in cultivation in the Herbarium Ground, Kew, and in February, 1935, produced one flower which approximated more to typical *G. nivalis*. It is possible that the giant condition of the original specimens is due essentially to habitat conditions.

Distribution: Central Europe, Caucasus; widespread in the Balkan Peninsula, but not in Crete.

IRIDACEAE.

Gladiolus segetum Ker-Gawl in Bot. Mag. t. 719 (1804).

Near Xenophontos, 18.4.34, in stony macchia, no. 2501; hills behind Pyrgos, 6.6.34, Mrs. Loch no. 13.

Distribution: Mediterranean Region, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

The specimens are young and the identification is not quite certain. The bracts and inflorescence are those of *G. segetum* but the flowers are smaller than usual in this species and the anthers slightly shorter. There is some convergence of characters to those of *G. illyricum* Ker-Gawl.

Iris Reichenbachii Heuff. in Oesterr. Bot. Zeitschr. 8, 28 (1858).

Simopetra, just above the arsenal, 13.4.34, stony sunny open places in macchia, No. 2362.

Very acutely keeled spathes. Tepals deep violet-purple.

Distribution: Hungary; central and northern districts of the Balkan Peninsula.

Romulea Linaresii Parl. Flor. Panorm. 1, 38 et Flor. Ital. 3, 246 (1858).

Between Simopetra and Karyes, 620 m., 13.4.34, no. 2322.

Flowers violet-purple.

Distribution: Mediterranean Basin (essentially); Crete, Greece, Cyclades, Thessaly, S. Macedonia, Thrace.

DIOSCOREACEAE.

Tamus communis L. Sp. Pl. 1028 (1753) var. **cretica** (L.) Boiss. Flor. Or. 5, 344 (1882).

Below Zographu, 16.4.34, in high macchia, no. 2408.

Distribution (of species): Central Europe, Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

LILIACEAE.

Allium margaritaceum S. et S. Prodr. 1, 224 (1806) et Flor. Graec. 4, t. 315 (1823).

Cultivated in the Herbarium Ground, Kew, in flower 24.8.36, as K.1393, from bulbs collected between Simopetra and Karyes, 13.4.34.

A large variety or form of the species which may be, *e descriptione*, var. *confusum* (Hal.) Hayek, Prodr. 3, 41 (1932). The flowering stem is up to 8 dm. high and the antheriferous cusp of the tricuspidate filaments is only slightly shorter than the lateral ones. The inflorescence is 5 cm. in diam. The variety was described, from Thessaly: "prope Malakasi, monasterium Korona (Hauskn.), in fauces Karava (Sint)," in Hal. Consp. 3, 244 (1904), pro sp.

Distribution (of species): Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

Allium trifoliatum Cyr. Pl. rar. Neap. 2, 11, t. 3 (1792).

Between Lavra and its Arsenal, 20.4.34, no. 2514.

Tepals white with purplish mid-vein.

Distribution: E. Mediterranean Basin; Crete, Greece, Cyclades.

Fritillaria pontica Wahlenb. in Isis 21, 984 (1828).

Karyes, 14.4.34, grassy semi-shady banks, no. 2272; above Simopetra, 13.4.34, in high macchia, no. 2313; on eastern slopes of Mt. Athos, high above Lavra, 800 m., 20.4.34, dampish places in *Abies* forest, no. 2527; hills behind Pyrgos, 11.4.34, coll. H. G. Chick, no. 2615.

Distribution: E. Mediterranean Basin; N. and S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif.

Gagea amblyopetala Boiss. et Heldr. in Boiss Diagn. 1, vii, 107 (1846).

Between Simopetra and Karyes, 620 m., 13.4.34, grassy, semi-shady place, no. 2323.

Yellow tepals.

Distribution: Asia Minor; Greece, Thessaly, S. Macedonia, Thrace.

Muscari racemosum (L.) Mill. Gard. Dict. ed. 8 (1768) sensu Hayek Prodr. 3, 9 (1932).

Below Zographu Monastery, 16.4.34, stony ground in macchia, no. 2424 ; Mikra Cemetery, north of Salonika, 11.4.34, dry stony ground, no. 2618 ; hills above Pyrgos, 25.4.34, no. 2620.

Distribution : W. Europe, Mediterranean Region, Caucasus ; general in the Balkan Peninsula.

M. tenuiflorum *Tausch* in *Flora* **24**, 234 (1841).

Mulyani Islands : small rocky island opposite Pyrgos, 13.4.34, collected by *H. G. Chick*, no. 2619 ; and 25.4.34, no. 2765.

Leaves broad. Perianth violet.

Distribution : Pannonian, Pontic, Caucasus ; Greece, N. Macedonia, N. and S. Bulgaria, Dobruja, Bosnia.

M. tenuiflorum is very doubtfully specifically distinct from *M. comosum* (L.) Mill. It is connected by a series of intergrades such as *M. Charvelii* Hal.

Ornithogalum pyramidale L. Sp. Pl. 307 (1753) subsp. **narbonense** (L.) *Aschers. et Graebn.* Syn. **3**, 255 (1905).

South-east of Pyrgos, 24.4.34, bare ground near the sea, no. 2718.

Flowers greenish-white.

Distribution (of species) : Mediterranean Basin ; widely spread in the Balkan Peninsula.

O. tenuifolium *Guss.* Prodr. Flor. Sic. **1**, 413 (1827).

Near Lavra, 19.4.34, in stony ground in macchia zone, no. 2500.

Distribution : S. Europe, Caucasus ; general in the Balkan Peninsula.

Ruscus Hypoglossum L. Sp. Pl. 1041 (1753).

Above Karyes, 680 m., 14.4.34, in shady woods of *Castanea*, no. 2308.

Distribution : S. Europe, Pontic ; S. Macedonia, Athos Peninsula, Thrace, N. and S. Bulgaria, Rodope Massif, Serbia, Bosnia, Hercegovina, Dalmatia, S. Croatia, Istria.

Scilla autumnalis L. Sp. Pl. 309 (1753).

Mulyani Islands : larger island opposite Pyrgos, 4.10.34, *Mrs. Lock* no. 9.

Distribution : W. Europe, Mediterranean Basin east to the Caucasus ; general in the Balkan Peninsula.

S. bifolia L. Sp. Pl. 309 (1753).

High above Simopetra, on way to Karyes, 620 m., 13.4.36, shady places in *Abies* and *Castanea* woods, no. 2300.

Blue tepals. Lush growing specimens with up to more than 20 flowers in a raceme.

Distribution : Central Europe, Mediterranean Basin east to the Caucasus ; general in the Balkan Peninsula.

Smilax aspera L. Sp. Pl. 1028 (1753) subsp. **eu-aspera** *Hayek* Prodr. **3**, 99 (1932).

Above Chilandari, 23.4.34, in macchia, no. 2698.

S. aspera L. subsp. **mauritanica** (*Desf.*) *Aschers. et. Graebn.* Syn. **3**, 323 (1906).

Between Stavronikita and Pantokratoros, 21.4.34, on slopes above the sea, in macchia on mica-schist, no. 2555 ; near Vatopedi, 13.7.34, climber in macchia near sea, very few fruits seen, no. 1533.

Distribution (of species) : Mediterranean Region ; Mediterranean and Transitional districts of the Balkan Peninsula.

ARACEAE.

Arisarum vulgare *Targ. Tozz.* in Ann. Mus. fis. Flor. **2**, 2.66 (1810).

Mulyani Islands : Pontiko Island, 20.6.34, *Mrs. Lock* no. 35 ; Simopetra, above the arsenal, 13.4.34, dry places amongst vegetation, no. 2366.

Distribution : Mediterranean Region ; Crete, Greece, Cyclades, Thessaly, Corfu, Dalmatia, S. Croatia.

Arum orientale *M. Bieb.* Flor. Taur.-Cauc. 2, 407 (1808) subsp. **elongatum** (*Stev.*) *Engl. Pflanzenr.* iv 23 F, 79 (1920).

Between Kapsokalývia and Lavra, 19.4.34, dry bushy slopes in macchia, no. 2486.

Spathe dark chocolate except at the greenish base. Leaves veined but not with white and not spotted. Spadix chocolate coloured or yellowish.

Distribution (of species): E. Mediterranean Basin, Pontic, Caucasus; Greece, Cyclades, S. Macedonia, Thrace, S. Bulgaria, Montenegro, Hercegovina, Dalmatia.

NAIADACEAE.

Posidonia oceanica (*L.*) *Del.* Flor. Aeg. Ill. 30 (1813).

Near Isphigmenou, 22.4.34, leaves cast up in considerable quantities on the shore, no. 2767.

Distribution: Mediterranean Basin; Mediterranean coastal districts of the Balkan Peninsula.

JUNCACEAE.

Juncus bufonius *L. Sp. Pl.* 328 (1753).

Near Xerxes Canal, 17.4.34, damp ground by the sea, no. 2463.

Distribution: cosmopolitan; general in the Balkan Peninsula.

Luzula Forsteri (*Sm.*) *Lam. et DC. Syn. plant. flor. Gall.* 150 (1806).

Above Karyes, 14.4.34, banks in *Castanea* woods, no. 2277.

Distribution: W. Europe, Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

CYPERACEAE.

Carex distans *L. Syst. ed.* 10, 1263 (1759) sensu Kükenthal in *Engl. Pflanzenr.* iv 20, 663 (1909).

Between Chilandari and Pyrgos, 23.4.34, damp spot on Plateau, no. 2687.

Distribution: General European, Mediterranean Region, Caucasus; widespread in the Balkan Peninsula.

C. distachia *Desf. Flor. Atl.* 2, 336 (1798).

Dionysiou, 18.4.34, on rocks above the monastery, no. 2506.

Distribution: Mediterranean Region; Greece, Corfu, N. and S. Macedonia, Athos Peninsula, Thrace, Montenegro, Hercegovina, Dalmatia, Istria.

C. divisa *Huds. Flor. Angl.* 348 (1762) var. **chaetophylla** (*Steud.*) *Daveau* in *Cyp. Port.* 47 (1792) sec. Kükenthal in *Engl. Pflanzenr.* iv. 20, 126 (1909).

Between Stavronikita and Pantokratoros, 21.4.24, damp spot in macchia on mica-schist slopes, no. 2550.

Distribution (of species): General European, Mediterranean Region, Caucasus and east to the Himalayas, also in S. Africa; widespread in the Balkan Peninsula.

Carex flacca *Schreb. Spic. Flor. lips. App.* no. 669 (1771) var. **cuspidata** (*Host, pro sp., Gram. Austr.* 1, 71, t. 97: 1801).

Between Pyrgos and Xerxes Canal, 17.4.34, dry macchia near the shore, no. 2438.

Distribution (of species): Central Europe and Mediterranean Region; widespread in the Balkan Peninsula.

Heleocharis palustris (*L.*) *R. Br. Prodr. Flor. Nov. Holl.* 224 (1810).

Between Pyrgos and Xerxes Canal, 17.4.34, marshy ground, no. 2456.

Distribution: E. N. Temperate Region (and S. Africa); general in the Balkan Peninsula.

Scirpus setaceus (*L.*) *Palla* in *Hall.-Wohlf.-Koch Syn. ed.* 3, 2538 (1905).

South-east of Pyrgos, 23.4.34, damp spot in macchia, no. 2712.

Distribution: N. Temperate Region; widely spread in the Balkan Peninsula, but not in Crete.

GRAMINEAE.

Agropyron sanctum (*Janka*) *Hack.* ap. Form. Verh. Naturw. Ver. Brünn 35, 157 (1896). *Festuca sancta* Jka. in Oester. Bot. Zeitschr. 21, 250 (1871).
Mt. Athos peak, 12.7.34, 1700 m., rocks, *H. G. Tedd* no. 1522.

Up to about 6.1 dm. high.

Distribution: Thessaly, Athos Peninsula.

Aira capillaris *Host* Gram. Austr. 4, 20, t. 35 (1809).

Hills behind Pyrgos, 11.6.34, *Mrs. Loch* no. 1; near Stavronikita, 21.4.34, in macchia on mica-schist slopes, no. 2548; near Pyrgos, 24.4.34, stony ground, no. 2749.

Distribution: Mediterranean Region, Caucasus; general in the Balkan Peninsula.

Anthoxanthum odoratum *L.* Sp. Pl. 28 (1753).

Plateau between Chilandari and Pyrgos, 23.4.34, in grassland, no. 2701.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

Avena barbata *Gott.* ap. Link in Schrad. Journ. Bot. 2, 315 (1799).

Mulyani Islands: small island opposite Pyrgos, 15.4.34, in brushwood, no. 2394.

A. barbata *Gott.* var. **Wiestii** (*Steud.*) vide Hausskn. in Mitt. Thür. Bot. Ver. N. F. 13, 48 (1899).

Near Pyrgos, 24.4.34, stony ground, no. 2748.

Distribution (of species): Mediterranean Region, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

Briza maxima *L.* Sp. Pl. 70 (1753).

Mulyani Islands: small island opposite Pyrgos, stony ground, collected *H. G. Chick*, no. 2578.

Distribution: N. Temperate Region; Mediterranean and Transitional districts of the Balkan Peninsula.

Bromus fibrosus *Hack.* in Oesterr. Bot. Zeitschr. 29, 207 (1879).

Mt. Athos peak, 12.7.34, 1700 m., rocky places, *H. G. Tedd* no. 1525.

Distribution: Balkan Peninsular type; Greece, Thessaly, N. Macedonia, Athos Peninsula, N. and S. Bulgaria, Rodope Massif, Serbia, Bosnia, Dalmatia, S. Croatia.

B. scoparius *L.* Cent. pl. 1, 6 (1755).

Near Chilandari, 22.4.34, in enclosed pasture, no. 2676.

Distribution: Mediterranean Region, Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

B. sterilis *L.* Sp. Pl. 77 (1753).

Near Kapsokalývia, 19.4.34, on limestone scree slopes above the sea, no. 2488.

Distribution: E. N. Temperate Region; general in the Balkan Peninsula.

B. tectorum *L.* Sp. Pl. 77 (1753).

Between Chilandari and Pyrgos, 23.4.34, grassland on the plateau, no. 2703.

Distribution: Central Europe, Mediterranean Region, Caucasus; general in the Balkan Peninsula.

Catapodium loliaceum (*Huds.*) *Lk.* Hort. Berol. 1, 45 (1827).

Mulyani Islands: small island opposite Pyrgos, 25.4.34, stony grassy ground, no. 2762.

Distribution: W. Europe, Mediterranean Region; Crete, Greece, Corfu, Thrace, Montenegro, Hercegovina, Dalmatia, S. Croatia, Istria.

Dactylis glomerata *L.* Sp. Pl. 71 (1753).

Mt. Athos peak, 12.7.34, 1900 m., rock crevices, *H. G. Tedd* no. 1513.

Grows to 3 and 4.6 dm. in height.

Distribution: N. Temperate Region; general in the Balkan Peninsula.

D. glomerata L. var. **hispanica** (Roth) Koch. Syn. 808 (1837).

Mulyani Islands: small island opposite Pyrgos, stony grassy places, no. 2260.

Holcus setiglumis Boiss. et Reut. Diagn. hisp. 27 (1842).

Between Chilandari and Pyrgos, 23.4.34, grassland on plateau, no. 2702.

Distribution: Mediterranean Region; Cyclades.

Hordeum leporinum Link in Linnaea 9, 133 (1835).

Between Chilandari and Pyrgos, 23.4.34, grassland on plateau, no. 2704.

Distribution: Mediterranean Region; widely spread in the Balkan Peninsula, but not in Crete.

Imperata cylindrica (L.) P. Beauv. Ess. Agr. 7-8, 165 (1812).

Near Pyrgos, 23.4.34, sandy bank near the sea, no. 2706.

Distribution: cosmopolitan (warm regions); Mediterranean and Transitional districts in the Balkan Peninsula.

Koeleria splendens Presl Gram. et Cyp. Sic. 34 (1820).

Mr. Athos peak, 1700 m., 12.7.34, among rocks, H. G. Tedd no. 1534.

Distribution: Mediterranean Basin; widespread in the Balkan Peninsula but not in Crete or the Cyclades.

Lagurus ovatus L. Sp. Pl. 81 (1753).

Near Stavronikita, 21.4.34, bare stony ground near the monastery, no. 2563.

Distribution: Mediterranean Basin east to the Caucasus; Mediterranean and Transitional districts of the Balkan Peninsula.

Lolium strictum Presl Cyp. et Gram. Sic. 49 (1820).

Mulyani Islands: small island opposite Pyrgos, 25.4.34, stony grassy places, no. 2761.

Distribution: Mediterranean Region; Greece, Cyclades, Corfu, Albania, Dalmatia, S. Croatia, Istria.

Melica minuta L. Mant. 32 (1767).

Above Simopetra, 13.4.34, dry stony ground, no. 2345; Kapsokalývia, 19.4.34, among stones on hot dry slopes, no. 2472.

Distribution: Mediterranean Basin; Crete, Greece, Cyclades, Corfu, Athos Peninsula, Dalmatia.

M. uniflora Retz. Obs. 1, 10 (1779).

Above Lavra, on slopes of Athos peak, 770 m., in stony ground in *Abies* zone, no. 2516.

Distribution: Central Europe, Pontic, Caucasus; general in the Balkan Peninsula.

Poa alpina L. Sp. Pl. 67 (1753).

Mt. Athos peak, 12.7.34, 1700-1900 m., rocky places, H. G. Tedd no. 1514. Nodes black.

Distribution: N. Temperate Region; widely spread in the Balkan Peninsula, but not in Crete.

P. bulbosa L. Sp. Pl. 70 (1753).

Between Pyrgos and Xerxes Canal, 17.4.34, stony ground in macchia, no. 2460.

Distribution: N. Temperate Region; widespread in the Balkan Peninsula.

Psilurus aristatus (L.) Duv. Jouv. in Bull. Soc. Bot. Fr. 13, 132 (1866).

South-east of Pyrgos, 24.4.34, among bushes by the sea, no. 2742.

Distribution: Mediterranean Region; general in the Balkan Peninsula.

CONIFERAE.

Abies. Mattfeld uses the name *A. Borisii-regis* in a series of papers, of which it is only necessary here to refer to that in Bibl. Bot. Heft 100 (1930), for the polymorphic population showing intermediate characters between *A. alba* and

A. cephalonica and characters of these species in various combinations. Mattfeld argues strongly that the population arose through hybridization of *A. alba* and *A. cephalonica*, but another possibility is that it represents an earlier evolutionary condition from which *A. alba* separated northwards and *A. cephalonica* southwards through loss of different genes and consequent purification. If the name *A. Borisii-regis* be used it is probably best to use it (as does Mattfeld l.c.) as a convenient designation for a mixed population and not as the name of a species co-equivalent to *A. alba* and *A. cephalonica*. Some specimens, at least, from the Rodope Massif can equally well be placed, varietally, under *A. alba*, and the material from Athos enumerated below can be placed under *A. cephalonica*.

The following plants were collected :

High above Lavra, on the slopes of Athos peak, at about 310 m., 20.4.34, in fir forest (locally pure, but sometimes mixed with deciduous trees) :

No. 2535, resinous buds, glabrous shoots, leaves obtuse, 0.7-3.0 cm. long.

No. 2536, resinous buds, glabrous shoots, leaves subobtuse, 1.3-3.0 cm. long.

No. 2537, strongly resinous buds, glabrous shoots, leaves obtuse and even slightly retuse to strongly acute (on the same tree), 1.8-3.3 cm. long.

No. 2538, strongly resinous buds, glabrous shoots, leaves mostly obtuse, 0.8-3.5 cm. long.

No. 2539, strongly resinous buds, glabrous shoots, leaves obtuse to subacute, 1.3-2.5 cm. long.

No. 2540, resinous buds, glabrous shoots, leaves mostly rounded at the apex or very slightly retuse, 1.5-2.8 cm. long.

No. 2541, buds rather slightly resinous, shoots glabrous, leaves subobtuse and sometimes slightly retuse, 1.1-3.0 cm. long.

No. 2542, buds scarcely resinous, shoots glabrous, leaves subacute, frequently retuse, 0.6-2.8 cm. long.

No. 2543, buds scarcely resinous, shoots glabrous, leaves acute to strongly acute, 1.4-2.5 cm. long.

Between Simopetra and Karyes, 13.4.34, in fir wood :

No. 2278, resinous buds, glabrous shoots, leaves acute, 2.0-2.9 cm. long.

No. 2279, slightly resinous buds, glabrous shoots, leaves sharply acute, 2.4-4.0 cm. long.

High above Simopetra, on way to Karyes, 13.4.34, in fir wood :

No. 2302, slightly resinous buds, glabrous shoots, leaves obtuse to rounded, frequently slightly retuse, 0.6-2.4 cm. long. Host of *Viscum*, No. 2301.

High above Simopetra, on way to Karyes, 13.4.34, 700 m., in fir wood :

No. 2312, strongly resinous buds, glabrous shoots, obtuse or truncate and often very slightly retuse on the flowering branches to acute on older branches, 1.5-2.0 cm. long.

Cupressus sempervirens L. Sp. Pl. 1002 (1753) var. **pyramidalis** (Targ. Tozz.) Nym. Consp. 675 (1878).

Near Zographu Monastery, 16.4.34, planted near the monastery grounds, no. 2769.

Distribution (of species) : Oriental ; Crete, Greece, Albania, Athos Peninsula, Thrace (often cultivated).

Juniperus oxycedrus L. Sp. Pl. 1038 (1753).

Between Chilandari and Pyrgos, 23.4.34, in macchia on the hills, about 160 m., no. 2710 ; between Karyes and Simopetra, 13.4.34, in pine woods, 200 m., no. 2311.

Distribution : Mediterranean Basin east to the Caucasus ; widespread in the Balkan Peninsula.

Pinus halepensis Mill. Gard. Dict. ed. 8 (1768).

Sithonia (Longos) Peninsula, 19.4.34, rocky hills, *H. G. Tedd* no. 1367, and near Armisti, coll. *H. G. Chick* and *H. G. Tedd*, no. 2562A. Forming forest where not destroyed by fire, and where this has happened apparently slowly regenerating. Head of Cassandra Gulf, W. of Nikitas, 12.4.34, tall trees in

mixed macchia, a hundred metres from the shore, nos. 2571, 2572, 2573, 2573A ; hill-slopes above Chilandari, in thick pine forest with macchia undergrowth, 23.4.34, no. 2697 ; between Chilandari and Pyrgos, 23.4.34, in open pine wood on plateau and ridge with *Erica arborea* macchia as undergrowth, nos. 2563A, 2564, 2565, 2566, 2567, 2568.

Distribution : Mediterranean Basin east to Caucasus ; Mediterranean districts of the Balkan Peninsula.

P. pinea L. Sp. Pl. 1000 (1753).

On high plateau (ridge) between Chilandari and Pyrgos, 23.4.34, scattered trees here and there subordinate to *P. halepensis* and with *Erica arborea* macchia as undergrowth, nos. 2569, 2570, 2695.

Distribution : Mediterranean Basin east to Caucasus ; southern Mediterranean districts of the Balkan Peninsula.

GNETACEAE.

Ephedra campylopoda C. A. Mey. Vers. Mon. Eph. 73 (1846).

Pyrgos, 5.12.34, Mrs. Loch no. 20 ; Mulyani Islands : Pontiko Island, 15.4.34, growing in rock crevices overlooking the sea, no. 2401. Not in flower, but of low trailing growth.

Distribution : E. Mediterranean Basin ; Mediterranean and Transitional districts of the Balkan Peninsula.

VASCULAR CRYPTOGAMS.

Adiantum Capillus-Veneris L. Sp. Pl. 1096 (1753).

Below Zographu Monastery, 16.4.34, shady damp places in macchia, no. 2431.

Asplenium Adiantum-nigrum L. Sp. Pl. 1081 (1753).

Simopetra, between the monastery and the arsenal, 13.4.34, shady stony bank, no. 2293.

A. lanceolatum Huds. Flor. Angl. ed. 2, 2, 454 (1778) var. **obovatum** (Viv.) Moore Ind. fil. 2, 140 (1857).

Near Dionysiou, 18.4.34, on shady rocks, no. 2465.

A. Trichomanes L. Sp. Pl. 1080 (1753).

Above Karyes, 14.4.34, on stones in *Castanea* woods, no. 2276.

Ceterache officinarum DC. Flor. Fr. 2, 566 (1805).

Simopetra, between the arsenal and the monastery, 13.4.34, on rocks, no. 2349.

Cheilanthes pteridioides (Reichb.) C. Chr. Index Filic. 178 (1905). *C. fragrans* (L.)

Simopetra, between the monastery and the arsenal, 13.4.34, no. 2291.

Cystopteris fragilis (L.) Bernh. in Schrad. Neu. Journr. Bot. 1806, 1, 2.26, 27, tab. 2, fig. 9.

High above Lavra, 800 m., on slopes of Athos peak, 20.4.34, damp shady places in *Abies* forest, no. 2534 ; south of Pyrgos, 24.4.34, shady ground among stones on slopes, no. 2719.

Dryopteris rigida (Hoffm.) Und. Our Native Ferns ed. 4, 116 (1893) et ed. 6, 114 (1900).

Below Zographu Monastery, 16.4.34, shady and damp places in macchia, no. 2430.

Osmunda regalis L. Sp. Pl. 1065 (1753).

Sithonia (Longos) Peninsula, near Armisti, 19.4.34, coll. H. G. Tedd and H. G. Chick, no. 2642.

Polypodium vulgare L. Sp. Pl. 1085 (1753).

Simopetra, above the arsenal, 13.4.34, shady places on trees, rocks, etc., no. 2365.

Selaginella denticulata (L.) Lk. Fil. hort. Berol. 159 (1841).

Simopetra, between the monastery and the arsenal, 13.4.34, shady macchia slopes, no. 2295, plants coloured green and reddish; above Zographu arsenal, 16.4.34, on rocks, no. 2411.

Equisetum Telmateia Ehrh. Hann. Mag. 1783, 18.

Between Stavronikita and Pantokratoros, 21.4.34, damp spot in macchia on mica-schist slopes, no. 2553.

XXIV—MISCELLANEOUS NOTES.

THE CORONATION.—By Command of HIS MAJESTY THE KING medals were forwarded to THE DIRECTOR, to Dr. T. A. SPRAGUE, Deputy Keeper of the Herbarium and Library, and to SERGEANT CONSTABLE J. SEALY, to be worn in commemoration of their Majesties' Coronation, May 12th, 1937.

CORONATION HONOURS.—We have much pleasure in recording the conferment of the following Honours:—K.C.M.G.—Sir David T. Chadwick, C.S.I., C.I.E., Secretary of the Imperial Economic Committee, and of the Executive Council of the Imperial Agricultural Bureaux; C.M.G.—Mr. A. J. Findlay, M.A., B.Sc., Director of Agriculture, Zanzibar, and Mr. C. F. M. Swynnerton, Director of Tsetse Research, Tanganyika Territory.

RETIREMENT OF MISS A. F. FITCH.—Miss Ada F. Fitch retired from the post of Sub-Assistant in the Herbarium on April 10th, 1937, after forty-five years' service at Kew. Her numerous friends will join in wishing her many years of happy and useful activity. It will be remembered that Miss Fitch's father was W. H. Fitch, the famous botanical artist. It is hoped that Miss Fitch will still be able to give some assistance in the Herbarium work, where her skilful manipulation has been of so much value during her long service at Kew.

MRS. BOLUS.—In K. B. 1937, 121, we recorded the conferment of an honorary degree on Mrs. F. Bolus by the University of Capetown. We now learn that it was Stellenbosch University and not the University of Capetown which has honoured Mrs. Bolus.

ALBERT WILLIAM BORTHWICK.—The death occurred on April 21st, at the age of 64, of Professor A. W. Borthwick, D.Sc., who for many years figured as one of the leading authorities on forestry questions in the British Isles. Professor Borthwick was the third son of the late W. H. Borthwick, Esq., of Crookston and Borthwick Castle. After taking a B.Sc. Degree at the University of St. Andrews, he went to Germany for three years where he studied Forestry, Geology and Agriculture. In 1904 he obtained his Doctorate for a Thesis on a botanical subject. He lectured on Plant Physiology at Edinburgh University for nine years, as Assistant

to the Professor of Botany, and he then followed the late Colonel Bailey as Lecturer on Forestry in the same University. He then became Chief Advisory Forest Officer to the Board of Agriculture for Scotland, and soon after the setting up of the Forestry Commission he became its Chief Research and Education Officer. In 1926 he was appointed Professor of Forestry in the University of Aberdeen, a position he occupied until the time of his death.

Professor Borthwick took a great interest in the work of the Royal Scottish Forestry Society. From 1913 to 1929 he edited the Society's Transactions, only giving up the work to become President of the Society during the years 1930-1931.

Professor Borthwick was a bachelor and a man of very kindly disposition. He was always ready to help all who needed his aid, and he made friends with all with whom he came in contact. He was one of the original members of the Management Committee for the National Pinetum at Bedgebury, but gave up the work when he went to Aberdeen.

W. DALLIMORE.

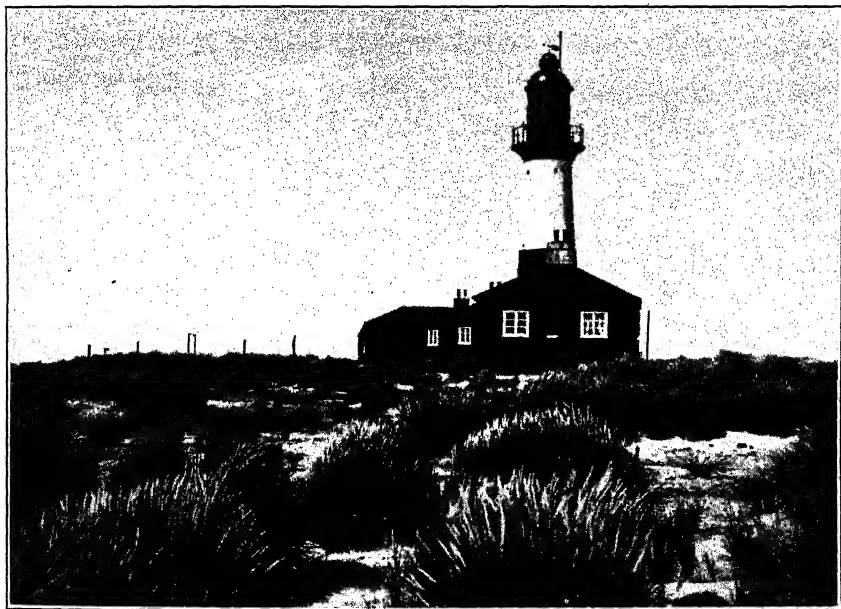
Sand-Binding Grasses in The Falkland Islands.—The planting of marram grass (*Ammophila arenaria* Link) is usually advocated for the consolidation of drifting sands in temperate regions and its use for this purpose in the Falkland Islands has yielded very satisfactory results. The Board of Trade lighthouse at Cape Pembroke, near Stanley, was situated in dismal surroundings. Sand, drifting from a source four or five miles from the light-house, had destroyed practically all the vegetation on the long peninsula and laid waste an area of about 1800 acres. In addition it had almost buried the first floor of the lightkeeper's quarters. In 1905, the late Mr. W. (later Sir William) Allardyce, then Governor of the Islands, after consultation with Sir William Thiselton-Dyer, then Director of Kew, suggested the use of marram grass and sea lyme grass (*Elymus arenarius* L.), for planting on the sands to prevent further drift. Seeds of marram grass were imported, whilst the lyme grass was obtained locally from Peeble Island where it had been established for a number of years. Methodical planting of these grasses was begun by Mr. James Reid, the Forester, about fourteen years ago. Recent photographs show that the planting has been most successful. The drift of sand has stopped and practically the whole area is now covered with the sand-binding grasses. We are indebted to the late Governor, Sir John Middleton, K.C.M.G., K.B.E., for much of the above information and for the accompanying illustrations (Plate VIII).

C. E. HUBBARD.

True and False Mahoganies.—Since the publication of the "List of True and False Mahoganies" (K.B. 1936, p. 193) a question has been raised as to the exact significance of the words "true" and "false" when used in this connexion. The present note is intended to remove any ambiguity which may exist owing to different



Marram grass on sands at Cape Pembroke, Falkland Islands.



Marram grass near Lighthouse, Cape Pembroke, Falkland Islands.

interpretations of these words by botanists, timber merchants and others.

The appellation "true" was restricted to the timbers of the several species of *Swietenia* on purely botanical and historical grounds. The first species to be exploited was *S. Mahogani* Jacq., from Jamaica, Cuba and other West Indian Islands. The timber was known as "Spanish mahogany" but other geographical adjectives, to indicate the place of origin, were used as well. The timber from the mainland of Central America, exploited shortly afterwards, was from *S. macrophylla* King, now known as "Honduras mahogany." These two species were probably the only *Swietenias* used, at least in any quantity, up to the year 1850. This is evident from a pamphlet entitled "The Mahogany Tree" published in 1851 by Messrs. Chaloner and Fleming, mahogany and timber brokers of Liverpool. Nicaragua, where *S. humilis* Zucc. occurs, is mentioned only as an untouched region. Nor is there any reference to mahogany from Africa. Two mahogany substitutes, *Soyimida febrifuga* A. Juss. and *Chloroxylon Swietenia* DC., are mentioned on the authority of an encyclopaedia. Both were placed in the genus *Swietenia* by early botanists, but are of no importance as mahogany substitutes in this country. It is, therefore, evident, that in 1850, both to botanists and to timber merchants, the name "mahogany" meant the wood of a species of *Swietenia*, which can thus be regarded as the "true" or "original" mahogany.

Expansion of the mahogany trade and a gradual depletion of supplies followed slowly on the repeal of the import duties in 1845. A large number of timbers were offered later as mahogany substitutes. Many of these are inferior to mahogany in strength, durability and other qualities, and do not even belong to the mahogany family (*Meliaceae*). Their substitution should be discouraged if mahogany is to retain its position as one of the most popular timbers for cabinet work.

It remains to consider whether the trade use of the name "mahogany" can be extended to the timbers of any other genus without prejudice to the good name of the true mahoganies. The only timbers of high quality (besides *Swietenia*) that are widely marketed under the name "mahogany" belong to the genus *Khaya* and are known as "African" mahoganies. Only this genus, which belongs to the *Meliaceae* and is closely related botanically to *Swietenia*, will therefore be discussed in this connexion.

The timbers of several species are imported in large amounts from West Africa both to this country and to the U.S.A. The more important are *K. ivorensis* A. Chev., *K. anthotheca* C. DC. and *K. grandifoliola* C. DC. The timber is of high quality, resembling *Swietenia* mahoganies very closely in colour, mechanical properties, durability and microscopic structure. The two genera are distinguished from one another by relatively small differences. In view of these facts, there can be no reasonable objection to the use of

"mahogany" as a trade description for *Khaya* timbers, providing the usual trade practice of prefixing a geographical adjective is followed. The argument that *K. senegalensis* A. Juss., formerly a source of West African mahogany, was at one time placed in the genus *Swietenia* is of no value in this connexion, since this applies also to plants now classified in the following genera of the *Meliaceae*: *Cedrela*, *Chloroxylon*, *Entandrophragma*, *Chickrasia* and *Soyimida*.

Sedum paraguayense (N. E. Br.) Bullock, comb. nov.—*Cotyledon paraguayensis* N.E. Br. in Kew Bull. 1914, 208.—*Byrnesia Weinbergii* Rose in Addisonia, 7, t. 243 (1922). *Sedum Weinbergii* (Rose) A. Berger in Engl. et Prantl, Nat. Pflanzenfam. ed. 2, 18a, 446 (1930); v. Poelln. in Fedde, Repert. 39, 263 (1936). *Echeveria Weinbergii* Hort.; Theodosia B. Shepherd, Descript. Cat. 34 (1912), nomen nudum.—*Echeveria paraguayensis* Hort.; v. Poelln. l.c., sub spp. excl.—*Echeveria arizonica* Hort.; Rose, l.c. et A. Berger, l.c. in syn.

The reference of this plant to the genus *Sedum* is perhaps debatable. Fröderström does not mention it in his recent account of the genus (in Acta Horti Gothob. 5 Appendix: 1930–35), but Berger and v. Poellnitz, as indicated above, include it. The cohesion of the petals apparently led the late Dr. N. E. Brown to describe the plant as a species of *Cotyledon*, and the same character induced Rose to describe his genus *Byrnesia*. There seems to be no reason, however, to suppose that this character alone is of generic importance.

The origin of the plant is unknown; it was sent to New York by F. Weinberg among a parcel of plants from Paraguay, and was then assumed to have come from that country. Its affinities, however, indicate that it is of Mexican origin, and the specific epithet is therefore somewhat unfortunate.

I am indebted to Mr. G. L. Wittrock of New York for the information that the epithet *Weinbergii* is invalid. Under the reference to Theodosia B. Shepherd cited above is the phrase "*Weinbergii* (New). Very handsome of bluish gray color, 25 cents and 50 cents." The plant is still in cultivation at Kew, where it flowers regularly in December and January.

A. A. BULLOCK.

Hooker's Icones Plantarum.*—The first part of vol. 4 of the Fifth Series, published in December 1936, includes four double and twenty-one single plates illustrating plants of special interest which have been the subject of study by members of the Herbarium staff and visitors. It contains figures and detailed descriptions of five

* "Hooker's Icones Plantarum or figures with descriptive characters and remarks of new and rare plants selected from the Kew Herbarium." Fifth Series. Edited for the Bentham Trustees by Sir A. W. Hill, K.C.M.G., Sc.D., F.R.S., Director, Royal Botanic Gardens, Kew; Honorary Fellow, King's College, Cambridge. Vol. 4, Part 1 (London, Dulau & Co., 1936). Price 10s.

new genera and eleven new or recently published species, and descriptions of four additional (unfigured) new species.

Two double plates (tt. 3310, 3311) are devoted to *Macrozamia Douglasii*, a cycad endemic in Fraser Island off the coast of Queensland. As in all cycads, apogeotropic roots are developed at a very early stage, producing coral-like clusters at the surface of the soil, containing nitrogen-fixing bacteria. Figures are given showing the seedling still attached to the seed, the general habit of the plant, the leaf, and both male and female cones with detailed dissections.

There are 16 pages of text accompanying t. 3312, *Ectrosia leporina* (Australia, New Guinea), forming a complete revision of this genus of grasses. Similarly, under tt. 3313, 3314, *Thaumas-tochloa rariflora* and *Th. Brassii* (both from Queensland), there are an enumeration of the four species of the new genus *Thaumastochloa* and a key to the eight genera of *Rottboelliastrae* represented in Australia.

Apochiton Burtii (3319) and *Cymbosetaria sagittifolia* (t. 3320) represent new African genera of *Gramineae*, belonging to the tribes *Eragrostae* and *Panicaceae* respectively. Appended to the description of the former are a key to and enumeration of the 38 genera now included in the *Eragrostae*.

Mr. G. B. Hinton's extensive collections in Mexico have supplied material for four of the plates. *Sickingia mexicana* (t. 3321) is not only a new species but a generic record for Mexico. *Rondeletia Jurgensenii* (t. 3322) was previously known only from rather poor material gathered nearly a hundred years ago by Jurgensen in the State of Oaxaca: it is now represented by ten different collectings in the District of Temascaltepec, State of Mexico. *Bouvardia cordifolia* (t. 3323), treated as a doubtful species by Standley (1926), and neither keyed nor described by him, was hitherto known only from an extremely brief diagnosis given by A. P. De Candolle in 1827, and from a tracing of a drawing in Sessé and Mociño's collection, which formed the basis of the diagnosis. It was collected in Temascaltepec towards the end of the eighteenth century by Sessé and Mociño, according to a specimen in the British Museum, and was rediscovered in that district in 1933 by Mr. Hinton. *Euphorbia fulva* (t. 3324) which was originally discovered in Jalisco by Pringle in 1902, has been re-described from the excellent material collected by Mr. Hinton in Temascaltepec. The male flowers are separated by curious paraphysal outgrowths which do not appear to have been noticed previously.

Combera paradoxa (t. 3325) is an extremely distinct new genus and species of *Solanaceae* discovered in the Neuquen district of Argentina by Mr. H. F. Comber. The plaited corollas when expanded present a circular appearance like that of a *Convolvulus*.

Studies on Indian *Araceae* by Prof. E. Barnes are represented by tt. 3305-7. A greatly amplified re-description of *Cryptocoryne consobrina* Schott (t. 3305) is supplied; the leaves of this species are

now known to be dimorphic, the submerged ones being narrowly linear with strongly crispate-undulate margins, while the emergent ones are narrowly lanceolate and flat.

Priotropis inopinata (t. 3317), from Tanganyika Territory, affords an interesting example of discontinuous generic distribution, the only other species being *P. cythroides* from the Eastern Himalayas, Burma and Siam, and *P. socotrana* from Socotra. *Burttidavya nyasica* is a new African genus of *Rubiaceae*, tribe *Naucleae*, forming a link between the genera *Sarcocephalus* and *Anthocephalus*.

The remaining plates represent the following plants:—*Jurinea taygetea* (t. 3301), *Amaracus scaber* (t. 3302), and *Teucrium aroanium* (t. 3303), all from Greece; *Scrophularia laciniata* var. *macedonica* (t. 3304), from Bulgaria; *Habenaria flabelliformis* (t. 3308), a recently described species discovered in Travancore by Prof. Barnes; *Schima sericea* (t. 3309), a new species from Sarawak; and two new species from the Solomon Islands, namely, *Bubbia haplopus* (t. 3315) and *Saurauia purgans* (t. 3316).

The Tropical Garden.*—In this book gardening in the tropics is considered from two main aspects, design and the choice of plants and their culture. The book is based on conditions prevailing in Hawaii but should be equally useful in many other parts of the tropics and subtropics.

The first six chapters are concerned with design and bear the following titles—The design of the tropical garden, Outdoor rooms for the tropics, Dry gardens and patios in the hot climate, Tropical water and rock gardens, Beach and mountain gardening, and Oriental influence in tropical gardens. The writers point out that the basic rules of garden design, harmony and balance, are the same the world over and that pronounced styles, such as the Italian, English, Spanish and Japanese are merely differences in the way these rules have been applied, due to different climates and plant materials. So far there is no such thing as a tropical style of gardening. In the authors' opinion "Such may develop in time based on the life of the people creating it." All too often gardens in the tropics are little other than copies of temperate gardens modified by the necessity of using different plants. The writers deplore this and hold that in the successful tropical garden wide spacing is to be avoided and success obtained by the massing together of subjects and the free use of large-leaved plants.

The listing and description of ornamental tropical plants occupies the greater part of the book, separate chapters being devoted to such groups as ferns, palms, large and small trees, shrubs, succulents, vines, annuals, orchids and lawns. Scientific and popular names are given to each plant described and the descriptions vary in length

*By L. E. Kuck and R. C. Tongg. The Macmillan Co., New York, 1936 Pp. xxiii + 378, plates 16. Obtainable from Macmillan & Co., Ltd., St. Martin's Street, London, W.C.2., price 12s. 6d. net.

according to the ornamental value of the plant in question. In a chapter entitled "Tropical fruits as ornamentals" the authors draw attention to the decorative value of such plants as the bread-fruit, sapodilla, carambola, several species of *Citrus* and the banana, particularly the red forms. They recommend the use of such plants even in gardens planned primarily for ornamental purposes, particularly where space is limited, for plants of this class naturally fulfil a dual function.

Several pages are devoted to the *Hibiscus*, perhaps the most popular of ornamental plants in the tropics. It is described as the "Official flower of the Territory of Hawaii," where its cultivation and the production of new forms by hybridization appear to attract special attention.

The final chapter contains a number of flower colour charts which should aid the tropical garden designer in providing variation in a garden which might otherwise tend to become monotonous. The colour categories adopted are purplish red, magenta and crimson; red, scarlet and orange-red; pink; yellow; orange and apricot; blue, lavender and purple; white and cream. The plants in these categories are sub-divided according to habit and the time of flowering of each species (under Hawaiian conditions) given separately. The book is illustrated by about four dozen well chosen photographs.

F. N. HOWES.

Hardy Californians.*—It is doubtful if a more ambiguous or controversial title could have been selected for this book on Californian plants. In her preface the authoress admits that hardiness is a "bugbear," but goes on to state that because of high altitudes, low temperatures, and a "constant more or less heavy blanket of snow" in which a plant grows "it surely must be able to survive severe winters anywhere." It must be borne in mind that the book is written, primarily, for American gardeners and conditions, but it is, nevertheless, a fact that while under a "blanket of snow," or even under dry and cold conditions, a plant may be perfectly hardy, the same plant may be proved *not hardy* under mild and damp climatic conditions.

The arrangement of the book is excellent. Commencing with the flora of the mountain tops, which the authoress terms the "Top of the World," she takes us down through the various floral zones, describing with considerable detail each plant association and, in the case of the larger genera, critically comparing and discussing, always with an eye to their decorative value, the various species. Chapters are devoted to the four large genera *Eriogonum*, *Penstemon*, *Lupinus* and *Viola*, and reading these alone makes one realise the mass of valuable material that has never been in cultivation. We can safely assume from the fact that some of those mentioned, e.g.,

* By Lester Rowntree. The Macmillan Company, New York, 1936. Pp. 255. Illustrated by 64 photographs taken by the authoress. Price 16s. net.

Lupinus Lyalli, *Penstemon heterophyllus* and *Viola pedata*, are in cultivation that many of the others described could successfully be grown in Great Britain.

Californian bulbs naturally have a chapter to themselves, and another is devoted to annuals. The latter deals with an interesting range of uncommon plants, including numerous annual species of well-known genera such as *Mimulus*, *Oenothera*, *Gilia*, *Phacelia*, etc. Although some of these species have been tried the majority have yet to make their debut in our gardens, and promise both interest and diversity in the annual borders of the future.

The authoress concludes with notes and comments on how to grow Californian plants, and gives practical advice on such diverse matters as selection, compost, sowing and transplanting.

The book throughout is written with an intimate knowledge of the plants, both in the field and under cultivation, and should be as interesting to the student of ecology as to the gardener, for whom, primarily, it has been written.

G. W. ROBINSON.

The Lily Year Book.*—The Lily Year Book of the Royal Horticultural Society for 1936 contains, in addition to articles of purely horticultural interest, several which are of importance to botanists. M. A. Tincker summarizes the results of scientifically controlled experiments carried out at Wisley on the propagation of lilies by scales; the best type of scale to employ, the position to be adopted (vertical or horizontal), depth to be planted, and also some preliminary tests as to temperature effects. The contractile roots of lilies—their structure, mechanics and function—have been re-investigated by F. Stoker. His account is presented in a light and non-technical style in order to stimulate the interest of the non-scientific reader. Amongst further items of botanical interest are a bibliography on the genus *Lilium*, consisting of some 550 references compiled by H. Souillet, and a note dealing in detail with the nomenclature of *L. Kelloggii* and *L. Bolanderi*, a case which affords an example of a peculiar type of difficulty but which may also arise in other groups. On the practical side a series of articles on lilies as grown in India, S. Africa, New Zealand and N. America indicates the interest of the volume to lily growers in all parts of the Empire.

* Lily Year Book, No. 5, 1936. Royal Horticultural Society, London, 1936. Pp. 131, 38 figs. Price 5s. paper, 6s. cloth.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 5, 1937 ROYAL BOTANIC GARDENS, KEW

XXV—THE GENUS *NEUROCALYX* IN BORNEO.

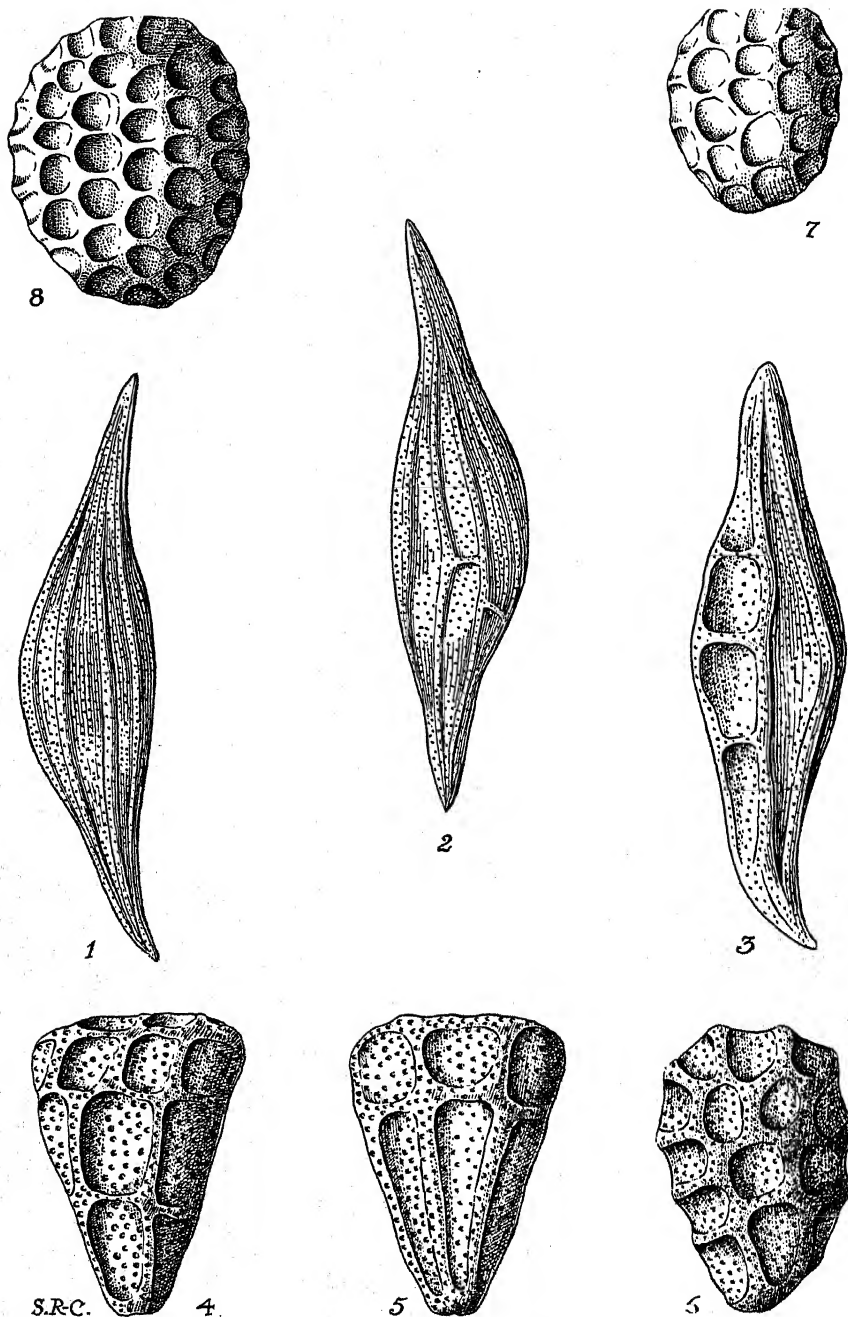
H. K. AIRY-SHAW.

Bornean specimens of *Neurocalyx* had been collected as early as the middle of the nineteenth century (e.g. by Lobb and Beccari), and were referred to in subsequent floras and general works (e.g. Hook. fil. Fl. Brit. Ind. 3, 47 : 1880 ; Baillon, Hist. Pl. 7, 330, 466 : 1880 ; K. Schum. in Engl. et Prantl, Nat. Pflanzenf. 4, 4. 32 : 1891 ; Boerlage, Handl. Fl. Nederl. Ind. 2 (1), 124 : 1896), but it was not until 1913 that any species were described. In December of that year descriptions of three species (*corollinus*, *borneënsis* and *elatus*) were published by Th. Valeton (in Fedde, Rep. 12, 513). Two years later a supposed fourth species, *N. matangensis*, was described by W. W. Smith (in Notes Roy. Bot. Gard. Edinb. 8, 323 : 1915). Further investigation, however, of the specimens referred to this species has shown that it consists of a mixture of forms of *N. borneënsis* and *N. corollinus* (see further under *N. borneënsis*, p. 288). Recently two new species have come to light exhibiting sepals modified into conspicuous organs of attraction in the manner of *Mussaenda* and *Warscewiczia*. The latter genera are not, of course, closely related to *Neurocalyx*.

The genus falls into two well-marked sections, both morphologically and geographically. The group containing the species originally described is distinguished by a racemose inflorescence and equal calyx segments, and is localised in Ceylon and southern India. In the other group the inflorescence is thyrsoid and the calyx-segments are usually very unequal ; the species are confined to Borneo. These two groups may be defined as follows :—

Series i. **Thyrsoideae** *Airy-Shaw*, ser. nov. Inflorescentiae thyrsoidae ; sepala saepe valde inaequalia ; semina fusiformia vel angulato-cuneiformia, testa costata vel reticulata et insuper minutissime foveolata.—Spp. 5–6, Borneënses (*vide infra*). Typus, *N. borneënsis* Valeton.

Series ii. **Racemosae** *Airy-Shaw*, ser. nov. Inflorescentiae racemosae ; sepala aequalia ; semina sphaeroïdea vel saltem rotundata, testa reticulata sed haud insuper foveolata.—Spp. 4–5, Zeylaniae peninsulaeque Indiae meridionalis incolae (*vide* Trimen, Handb. Fl. Ceyl. 2, 299 : 1894 ; Alston, Suppl. 141 : 1931 ; Gamble, Fl. Pres. Madr. 591 : 1921). Typus, *N. zeylanicus* Hook. fil. (*Cf.* Tab. 1, figs. 7, 8.)



Tab. 1. Representative types of seeds of *Neurocalyx*. 1, 2, *N. pterosepalus* Airy-Shaw (Richards 1622). 3, *N. elatus* Valetton (type). 4, 5, *N. borneensis* Valetton var. *oligotrichus* Airy-Shaw (type). 6, *N. corollinus* Valetton (Haviland 682). 7, *N. zeylanicus* Hook. (Walker, type). 8, *N. calycinus* (R. Br.) B. L. Rob. (*N. Wightii* Arn.; Shivagerry, Wight, type of *N. Wightii*). All $\times 80$.

The seeds afford good characters for distinguishing groups of species. Those of Series *Racemosae* are rather uniform, subspherical, with a rounded type of reticulation and no minute pitting in addition (Tab. 1, figs. 7, 8). In Series *Thyrsoideae* two main types are found: the subcuneiform and reticulate, and the fusiform and costate. Of the two species belonging to the former type, *N. corollinus* (Tab. 1, fig. 6) has seeds most closely resembling those of the *Racemosae*, but the reticulation is considerably coarser and less rounded, and the presence of the additional minute pitting, common to all the *Thyrsoideae*, as well as the subcuneiform general shape, at once distinguishes it. The truncate-cuneate seeds of *N. borneënsis* (Tab. 1, figs. 4, 5), with their squarish or elongate reticulation, are very characteristic. The fusiform type of seed characterizes *N. pterosepalus* (Tab. 1, figs. 1, 2), *N. pleurocarpus* (not figured) and *N. elatus* (Tab. 1, fig. 3), the differences between them being small. The seeds of *N. pleurocarpus* may be distinguished from those of *N. pterosepalus* by the occasional cross-connections between the ridges being oblique rather than transverse.

KEY TO SERIES THYRSOIDEAE.

Unum sepalum floris centralis cuiusque cymulae in appendicem magnum unguiculato-spatulatum rigide membranaceum auctum; stylus pilosus; semina fusiformia; frutices usque 3 m. alti:

Robusta; caulis usque 1 cm. diametro; folia bullata, nervis primariis utrinque 13-19; sepala normalia lanceolata; capsulae oblongae, ecostatae ... 1. *pterosepalus*

Gracilior; caulis usque 3 mm. diametro; folia plana, nervis primariis utrinque 10-13; sepala normalia parva, triangulari-subulata; capsulae breviter ovoideae, conspicue costatae ... 2. *pleurocarpus*

Sepala haud uti supra aucta; herbae pusillae usque suffrutices 1 m. alti:

Stylus pilosus; semina fusiformia ... 3. *elatus*

Stylus glaber; semina truncato-cuneiformia vel ovoidea, testa foveolato-reticulata:

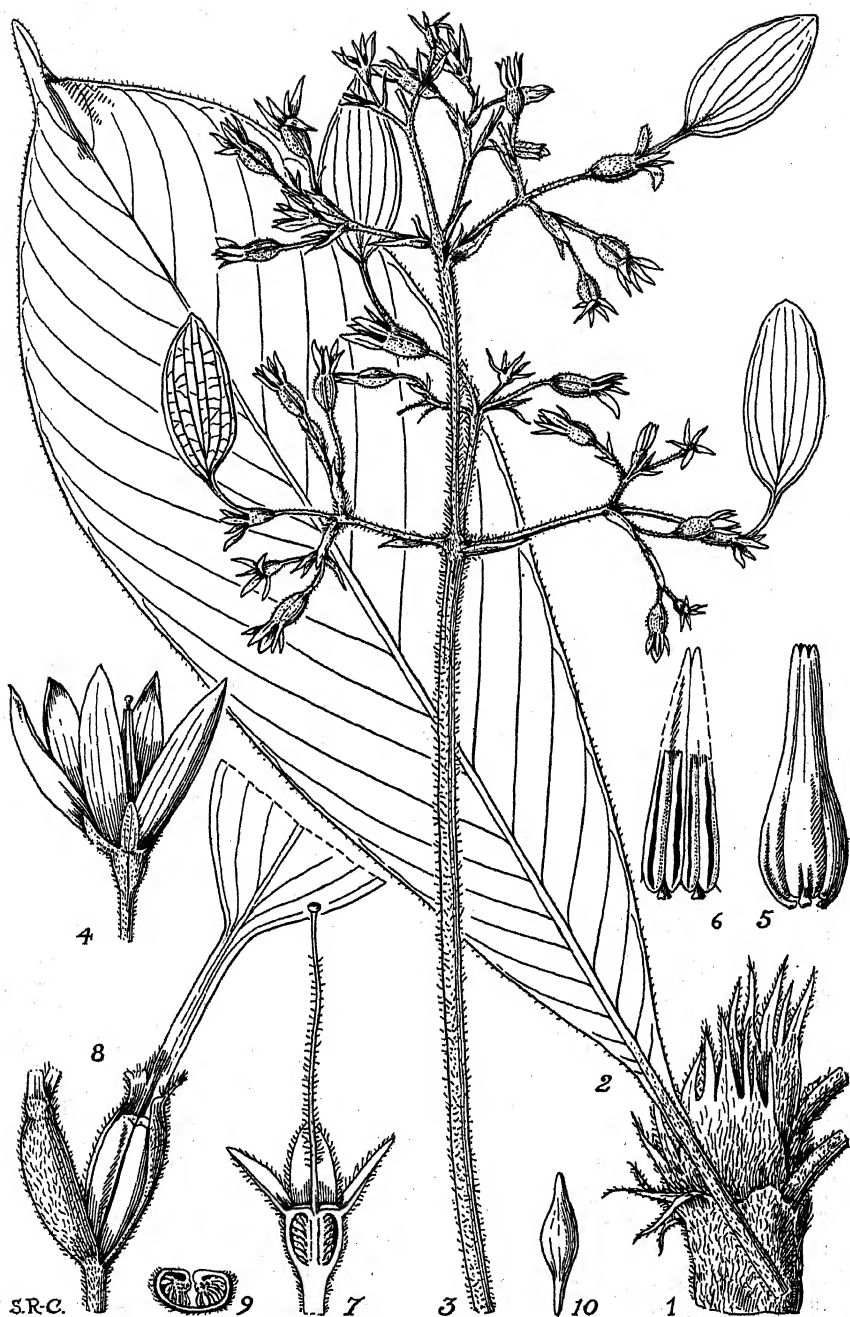
Folia basi angustata; sepala inaequalia; semina truncato-cuneiformia ... 4. *borneënsis*

Folia basi rotundata; sepala angusta, aequalia; semina subcuneiformi-ovoidea ... 5. *corollinus*

1. **Neurocalyx pterosepalus** *Airy-Shaw* ex Richards in Journ. Ecol. 24, 352 (1936), *nomen*; sp. nov. insignis, in genere facile maxima, a *N. pleurocarpo* *Airy-Shaw* (*vide infra*) habitu robustiore, foliis bullatis, nervis crebrioribus, sepalis normalibus maioribus lanceolatis, capsulis oblongis ecostatis distincta. (Tab. 2).

Frutex 2-3 m. altus. *Caulis* simplex, circiter 1 cm. crassus, inferne nudus, plus minus angulatus, nodis et cicatricibus foliorum

delapsorum crebre notatus, cortice fusco dense pubescente, internodiis plerumque 1–2 cm. longis. *Folia* oblanceolata, rarius fere oblongo-oblanceolata, 15–25 cm. longa, 5–7.5 cm. lata, basi sensim cuneato-attenuata, apice plus minus rotundata (rarius subacuta) et brevissime late cuspidata, margine integro revoluto, supra parce longiuscule fulvido-pilosa, demum glabrata, subtus praesertim costa nervisque adpresse sericeo-fulvido-pilosa et simul pilis minimis curvulis undique conspersa, siccitate flaccidulo-herbacea, brunnescentia, supra obscura, infra plus minus nitentia, per lucem transmissum visa mesophylla aureo-brunneo-translucente, venulis ultimis reticulum densissimum efformantibus; costa et nervi primarii supra bullato-impressi, infra valde prominentes, nervi primarii a costa angulo circiter 45° orti, stricte paralleli, 5–10 mm. inter se distantes, inferiores fere usque ad marginem recti, superiores inde a medio sursum arcuati, omnes prope marginem anastomosantes; nervi secundarii angulo subrecto inter primarios laxe scalariformiter dispositi, multo graciliores; petioli 2–4 cm. longi, 2–3 mm. lati, striati, parce adpresso-pubescentes. *Stipulae* maximae, ochreiformes, supra petiolos annulatim connexae, plus minus ovatae, usque 3 cm. longae, apice alte et acute laciniatae, laciniis subulatis, submembranaceo-herbaceae, parallelo-nervosae, brunneae, extra undique brevissime crispulo-puberulae, basin versus longe adpresso-sericeae, intus omnino sericeae, sericeo-ciliatae. *Inflorescentiae* (tempore florendi nondum cognitae) axillares, regulariter thyrsoidae, foliis subaequilongae, longissime pedunculatae, iuniores cernuae, maturae patulae; pedunculi 10–17 cm. longi, 1–2 mm. diametro, teretes, subtiliter striati, subrecti, dense crispulo-puberuli et sparsius adpresse strigosi; ramuli patuli vel patentes vel interdum leviter reflexi, breves, usque 2 cm. longi, iterum ternatim ramosi, inferioribus flores 7, superioribus flores 3 plerumque gerentibus, indumento flavido duplici ut pedunculus omnino induti; bracteae bracteolaeque lanceolatae (rarius sub ramulos infimos late ovatae), acutae, 5–8 mm. longae, submembranaceae, nonnunquam basi laciniis paucis subulatis vel setaceis glanduliferis utrinque auctae, basi ramulos plus minus amplectentes; pedicelli 5–15 mm. longi, graciles. *Hypanthium* obovoideo-oblongum, circiter 2 mm. longum, pubescens. *Sepala* normalia lanceolata, 2 mm. longa, strigosa, basi glandulis paucis anguste cylindricis stipitatis utrinque instructa. *Petala* contorta, lanceolato-oblonga, circiter 8 mm. longa, glabra. *Antherae* subsessiles, lanceolatae, in conum circiter 6 mm. longum cohaerentes. *Stylus* gracilis, circiter 7 mm. longus, patenter pilosus, stigmatibus capitato. *Capsulae* oblongo-obovoideae, 4–6 mm. longae, 3–4 mm. latae, subdidymae, subtiliter nervoso-striatae, pubescentes, in mericarpiis duo demum solutae, calycis segmentis persistentibus erectis, floris terminalis cuiusque cymuli uno sepalo (raro duobus) valde aucto membranaceo, more *Warszewicziae* vel *Mussaendae*, longe unguiculato-spatulato, ungue plano 5–10 mm. longo 1 mm. lato 7-nervio pubescente,



Tab. 2. *Neurocalyx pterosepalus* Airy-Shaw. 1, part of stem, showing stipules, nat. size; 2, leaf, nat. size; 3, inflorescence, nat. size; 4, flower, $\times 3$; 5, androecium, from without, $\times 6$; 6, two stamens, from within, $\times 6$; 7, flower in longitudinal section, corolla and stamens removed, $\times 6$; 8, capsule dehiscing, also showing base of enlarged sepal, $\times 3$; 9, transverse section of carpel, $\times 3$; 10, a seed, $\times 20$.

limbo oblongo vel lanceolato-oblongo 2-3 cm. longo 1-1.4 cm. lato apice rotundato saepe apiculato longitudinaliter 5-7-nervio pulchre reticulato-venoso supra obscuro subtus nitente nervis subtus sparse puberulis ceterum glabro pallide roseo. *Semina* numerosa, minuta, vix 1 mm. longa, late fusiformia vel cymbiformia, utrinque attenuata, testa castanea longitudinaliter costata, costis longitudinalibus trabeculis paucis transversis interdum coniunctis.

SARAWAK. Dulit ridge, moss-forest, c. 1230 m., 1 Aug. 1932, *Richards* 1057 (typus, Herb. Kew.): "Thin shrub, c. 3 m. high. Leaves crowded in a tuft at the apex of the stem." Ibid., 8 Sept. 1932, *Richards* 1622: "Shrub, 2-3 m. high. Lower part of stem leafless. ? Bract pale pink. Inflorescence pink."

The present species is placed first as probably representing the nearest approach in habit to the generic prototype. The *Schauaparat* provided by the enlarged sepal of certain flowers of the inflorescence, and the drawn-out testa of the seeds, are on the other hand no doubt characters of a derivative nature. An interesting comparison may be drawn between the types of seeds in *Neurocalyx* and those in *Rhododendron*, referred to by Ridley in his "Dispersal of Plants," 127, t. III (1930) and in greater detail by Kingdon Ward in Journ. Bot. 73, 241 (1935). Unfortunately, enough is not yet known of the habitats of *Neurocalyx* species to render a detailed comparison possible. *N. pterosepalus* is a lanky shrub of the moss-forest on Mt. Dulit, but it seems unlikely that the closely allied *N. pleurocarpus* (see below) would occur in a similar formation as low down as 150 m. on Mt. Lambia, though there may well be a development of moss-forest on the 1000 m. high Batu Ajoh (see *N. elatus*, below). Ridley emphasizes the fact that this type of seed ("dust-seed") is primarily an adaptation for wind-dispersal, which may account for the apparent correlation of "dust-seed" with tall habit in *Neurocalyx*. The rounded or angular, unwinged seeds of the low-growing species are presumably dispersed by rain-wash.

2. *Neurocalyx pleurocarpus* *Airy-Shaw*, sp. nov., *N. pterosepalo* *Airy-Shaw* affinis, sed omnibus partibus minor graciliorque, foliis tenuioribus haud bullatis, nervis distantioribus, sepalis parvis triangulari-subulatis, capsulis breviter et late ovoideis conspicue costatis.

Suffrutex parvus vel *herba* elata, statura ignota. *Caulis* (apice tantum cognito) ut videtur simplex, 2-3 mm. diametro, adpresse strigoso-pubescent, internodiis 1-2.5 cm. longis. *Folia* oblonga usque oblongo-oblancoolata, 13-21 cm. longa, 3-5 cm. lata, basi sensim angustata, apice breviter caudato-acuminata, margine integro plano, supra brevissime et parcissime pilosa, costa adpresse strigoso-pubescente, subtus parce crispule pubescentia, costa nervisque pilis longis et brevibus densiuscule adpresse strigosis, membranacea, siccitate vix brunnescentia, sed sub lente pagina superiore punctis minutis brunneis dense conspersa, utrinque

obscura (i.e. haud nitentia), haud conspicue translucientia; costa nervique supra plani, subtus prominuli; nervi primarii graciles, 10-13-jugi, angulo circiter 45° a costa orti, 1.2-1.7 cm. inter se distantes, prope marginem anastomosantes; nervi secundarii et ultimi tenuissime reticulati; petioli 3-5 cm. longi, adpresse strigosi. *Stipulae* late ovatae, circiter 1 cm. longae, 7-8 mm. latae, acuminatae, laciniatae, membranaceae, conspicue nervosae, medio dorso longe strigosae, intus dense strigosae, margine longe ciliatae, ceterum glabrae. *Inflorescentiae* axillares, regulariter thyrsoidae, foliis subaequilongae, longe pedunculatae, patulae; pedunculi 6-11 cm. longi, modice graciles, teretes, subtiliter striati, subrecti, basi saepe abrupte deflexi, densiuscule adpresso-pubescentes; ramuli patuli, graciles, 1-2 cm. longi, sparsius adpresso-pubescentes, ut in *N. pterosepalo* iterum ramosi; bracteae bracteolaeque lineares vel angustissime lanceolato-ellipticae, acutae, 3-10 mm. longae, 0.5-2 mm. latae, submembranaceae, nervosae, basi "stipulis" parvis subulato-setaceis glandulo-apiculatis instructae; pedicelli graciles, 8-18 mm. longi. *Hypanthium* compresso obovoideum usque subglobosum, 1 mm. diametro, angulatum. *Sepala* normalia triangulari-subulata, 1-1.5 mm. longa, acuta, margine basin versus glandulis elongatis praedita; sepala dilatata (sub tempore florendi) anguste oblongo-oblanceolata, 10-12 mm. longa, 1.5 mm. lata, utrinque angustata, acuta, membranacea, trinervia, glabra. *Petala* basi brevissime connata, lanceolata, 6-7 mm. longa, circiter 1.5 mm. lata, sensim acuminata, acuta, basi abruptiuscule angustata, 5-nervia, aestivatione contorta. *Antherae* anguste lanceolatae, subsessiles, in conum angustum acutum circiter 5 mm. longum cohaerentes. *Stylus* filiformis, antheras paullo superans, patenter pilosus, stigmatem parvo capitato. *Capsula* breviter et late compresso-ovoidea, 3 mm. longa, 3-4 mm. lata, conspicue 10-costata, parce pubescentia, sepalis persistentibus coronata, sepalo dilatato fere ut in *N. pterosepalo*, sed ungue 10-12 mm. longo, lamina 3-5-nervi acuta mucronata. *Semina* numerosa, fusiformia, 1 mm. longa, testa castanea longitudinaliter costata (costis trabeculis obliquis raro connexis) utrinque in caudam tenuem producta.

SARAWAK. Mt. Lambia, 150 m., May 1895, *Haviland & Hose* (B.M. distrib. no.) 2005 (Herb. Mus. Brit.).

I am indebted to Messrs. A. H. G. Alston and C. Norman for calling my attention to this interesting plant, which was included in a small collection recently found by them in the store of the Department of Botany, British Museum. I have to thank the Keeper for the loan of material for investigation. This collection is not represented in the Herbarium of the Royal Botanic Gardens, Kew. It is apparently the last collection which Haviland and Hose made, and from an area not previously visited by them, nor, so far as I am aware, by any subsequent collectors.

The material of *N. pleurocarpus*, though ample, unfortunately consists only of the uppermost part of each stem, so that it is not

possible to estimate the height of this plant. It is closely allied to *N. pterosepalus*, but is smaller in all its parts, and the shortly ovoid, not oblong, capsule is conspicuously ribbed.

Mt. Lambia or Lambir is a peak rising to a height of 465 m. near the centre of a sandstone ridge running parallel to and about 5 miles from the coast, about 25 miles south of the mouth of the Baram River in northern Sarawak (cf. map of the Baram district, illustrating Hose's paper on his journey to Mount Dulit, in Geogr. Journ. 1, 193: 1893). It is about 70 miles north of Mt. Dulit, likewise of sandstone formation. It is a remarkable fact that so far no representative of the genus *Neurocalyx* is known from the sandstone spurs around Kinabalu, despite the collecting work of Low, Haviland, Gibbs and the Clemens. Mt. Lambir is therefore the most northerly known locality for the genus.

3. *Neurocalyx elatus* Valetton in Fedde, Rep. Spec. Nov. 12, 514 (1913); Merrill, Bibl. Enum. Born. Pl., in Journ. Str. Br. Roy. As. Soc., special no., 550, 592 (1921).

DUTCH BORNEO: South and East Division. Bukit Batu Ajoh, 1896-7, *Jaheri* in Exped. *Nieuwenhuis* 1655 (Herb. Hort. Bog.).

The peak of Batu Ajoh (Ajo, Ajow) is situated in approximately lat. 0° 45' N. and long. 5° 45' E., on the right (south) bank of the upper Mahakam River. According to Nieuwenhuis, in Peterm. Geogr. Mitteil. 44, 12 (1898), it rises to a height of 1000 m. and is composed of sandstone. This is the most easterly locality for *Neurocalyx* in Borneo and so far the only record for the genus in the S. & E. Division.

As in the case of *N. pleurocarpus*, the precise stature of the plant remains unknown, since only the upper part of the stems was collected. *N. elatus* forms a transition from the *pterosepalus* type to the *borneënsis* type, agreeing with the former in the fusiform seeds and hairy style and with the latter in the absence of the enlarged sepal.

It is not clear why Valetton, in his original description, stated "Capsula ignota." On the two sheets in Herb. Bogor. (cf. Plate IX), which were kindly sent on loan to Kew by the Director, Dr. D. F. van Slooten, there are numerous capsules present, some containing ripe seed. A description of these is now supplied.

Capsula oblonga, 4-5 mm. longa, 2.5-4 mm. lata, strigoso-pilosa, sepalis persistentibus erectis. *Semina* fusiformia, vix 1 mm. longa, testa utrinque breviter caudato-attenuata longitudinaliter costata et parce reticulata pallida.

4. *Neurocalyx borneënsis* Valetton, l.c.; Merrill, ll.cc.

N. matangensis W. W. Smith in Notes Roy. Bot. Gard. Edinb. 8, 323 (1915), pro maiore parte; Merrill, l.c. 550 (1921), pro maiore parte.

Under *N. matangensis* nine specimens were cited, in chronological order, but none was designated as the type. Of the four specimens from Mt. Matang (the remainder being either from other localities

PLATE IX

[*Kew Bulletin*, 1937



Neurocalyx elatus Valetton. Type specimen (Herb. Hort. Bogor.)

or unlocalised), *Haviland* 682 is referable to *N. corollinus* Val., a species readily distinguished by the rounded base of the leaf-lamina and by the narrow sepals; *Ridley* 11,750 differs from all others in the very short adpressed pubescence of the leaves and in the absence of long setulae on the capsule, and is here treated as a variety of *N. borneënsis* Val.; *Native Collector* 104 is again *N. corollinus*; and *Native Collector* 244 agrees well with the type of *N. borneënsis*. The remaining specimens are referable as follows: *Lobb* s.n. to *N. borneënsis*; *Beccari* 1695 to *N. corollinus*; *Beccari* 2965 to *N. borneënsis*; *Haviland* 677 to *N. borneënsis* var. nov.; and *Haviland & Hose* 3412 to *N. borneënsis* var. nov. altera. In view of the fact that three of the four specimens cited from Mt. Matang (as well as three others) agree with the types of previously described species, it seems advisable to abandon the epithet *matangensis* altogether, rather than employ it even varietally for the one Matang specimen (*Ridley* 11,750) which does actually represent a new form.

var. **typicus** *Airy-Shaw*, var. nov. omnibus partibus longe strigosus.

DUTCH BORNEO: West Division. Landak, *Teysmann* s.n. (lectotypus, Herb. Kew.) et 11,222. Ad pedem montis Damoer*, *Hallier* B. 499 (teste Valetton; non vidi).

SARAWAK. Sine loc. exact., sandstone rocks, 750 m., *Lobb*. Sine loc. exact., *Beccari* 2965. Puak, Sept. 1905, *Ridley* 12,451. Matang, 5 Dec. 1913, *Native Collector* E 244 (Herb. Edin.). Ibid., 2 Jan. 1915, *Ridley* s.n. (Herb. Mus. Brit.).

var. **typicus** forma **micranthus** *Airy-Shaw*, f. nov. inflorescentia brevissima congesta, floribus parvis, sepalis 2–3 mm. tantum longis.

SARAWAK. Baram, May 1894, *Haviland & Hose* 3412 (typus, Herb. Kew.). Matang, Jan. 1915, *Ridley* s.n.

var. **oligotrichus** *Airy-Shaw*, var. nov. pilis foliorum pagina superiore brevibus circiter 1 mm. longis sparsis, ceteris partibus minus strigosus.

SARAWAK. Sepudang, 1891, *Haviland* 677 (c.k.o.e.): "Herb, 3 ft.; corolla white, tube short."

var. **brachytrichus** *Airy-Shaw*, var. nov. foliis undique pilis minimis adpressis crebre vestitis.

SARAWAK. Matang, July 1893, *Ridley* 11,750. The following is provisionally referred here:—Ulu Koyan, shaded sandstone cliff, c. 800 m., 22 Sept. 1932, *Richards* 2023: "Flower buds pink."

var. **dulitensis** *Airy-Shaw*, var. nov. foliis minoribus supra praeter costam fere glabris, nervis primariis lateralibus angulo recto vel fere recto ortis.

SARAWAK. Baram, Mt. Dulit, 900–1500 m., March 1894, *Haviland & Hose* 3533. Bakam, 20 May 1895, *Haviland & Hose* (B.M. no.) 2026. Mt. Lambia, 150 m., 23 May 1895, *Haviland & Hose* (B.M. no.) 2025. Mt. Dulit, 1200–1500 m., Jan. 1923, *Mjöberg* 5.

* Probably an error for Damoes (Damus), in the Landak district: cf. Molengraaff in Peterm. Geogr. Mitteil. 41, 202 (1895).

Dulit Trail, c. 800 m., moist mossy rocks in slight shade, 27 Aug. 1932, *Richards* 1482 (typus, Herb. Kew.) : "Petals white, somewhat translucent. Leaves rugose, veins and petioles red." Ibid., wet rocks in shade, 29 Aug. 1932, *Richards* 1538 : "Fls. white. Leaves rugose."

var. **dulitensis** forma **pubescens** *Airy-Shaw*, f. nov. foliis supra longe dense patule pubescentibus.

SARAWAK. Dulit Ridge, c. 1200 m., wet rocks in spray of waterfall, 10 Sept. 1932, *Richards* 1676 : "Petals white."

The variety *dulitensis* is perhaps sufficiently distinct to rank as a species, but, in the absence of any floral distinctions, and in view of the seemingly great variability of *N. borneënsis*, it seems preferable to treat it for the present as a variety. More ample material may also provide intermediates between the first three varieties.

The field notes of Lobb and of Richards again bring out the preference of *Neurocalyx* for sandstone. Mt. Matang is of the same formation (cf. Scrivenor in Journ. Mal. Br. R. As. Soc. 5, 292 : 1927). The occurrence of the genus at elevations of 150 m. and less in the neighbourhood of the coast (Bakam, between Mt. Lambir and the sea) is noteworthy.

5. **Neurocalyx corollinus** *Valeton*, l.c. 513 (1913) ; Merrill, ll.cc. *N. matangensis* W. W. Smith, l.c., pro minore parte ; Merrill, l.c., pro minore parte.

SARAWAK. Prope Kuching, *Hewitt* (typus, Herb. Bog. ; non vidi). Mt. Santubong, March 1906, *Hewitt* (Herb. Lugd. Bat.). Sine loc. exact., *Beccari* 1695. Matang, 900 m., 1891, *Haviland* 682 (c.l.n.m.). Ibid., 1 Dec. 1913, *Native Collector* E 104 (Herb. Edin.). Ibid., Jan. 1915, *Ridley* s.n. (Herb. Mus. Brit.).

From the collections examined, *N. corollinus* appears to be a well-defined entity. It is certainly close to *N. borneënsis*, but the characters of leaf-base and calyx-segments mentioned above (p. 289) are constantly associated and easily observable. It will be noticed that both are covered by Wright Smith's description of *N. matangensis* : "Folia . . . basi . . . rarius subrotundata" ; "Calycis . . . lobi . . . nunc omnes subaequales lanceolati." The significance of the epithet *corollinus* is not clear ; it was perhaps chosen as an antithesis to that of the S. Indian species *N. calycinus* (R. Br.) B. L. Robinson, but the corolla of the present species is in no way remarkable.

Two undescribed species are probably represented by the following collections in Herb. Kew. : Sarawak, sine loc. exact., *Beccari* 3953 ; Matang, 28 Aug. 1905, *Ridley* s.n. They are considerably smaller than any of the known species. Unfortunately, however, the material does not permit of adequate description.

XXVI—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXXI.*

PLANTAE MEXICANAE HINTONIANAE: III.†

This is a further contribution based upon Mr. G. B. Hinton's large Mexican collections, which now include over 10,000 numbers, all gathered in the small area comprising the adjoining districts of Temascaltepec, Coyuca and Huetamo, situated in the states of Mexico, Guerrero and Michoacan respectively. The collection is perhaps the most intensive that has ever been made in Mexico. It is especially important because many of the species which were collected by Sessé and Mociño, Jurgensen, Hartweg, Ehrenberg and others, in the same area, and which have remained more or less obscure or incompletely known, have been elucidated by Mr. Hinton's rediscoveries. A typical example is *Gentiana salpinx* Griseb., collected by Ehrenberg in Temascaltepec in 1831. Mr. Hinton collected this again in 1932 and subsequently, and a figure, prepared from his specimens, has appeared in "Hooker's Icones Plantarum" t. 3299.

MALVACEAE (A. A. Bullock).

Malvaviscus Hintoni Bullock, sp. nov.; *M. Conzattii* Greenm. affinis, sed floribus albidis, auriculis petalorum longioribus oblongis angustioribus, bracteis involucri calycem haud superantibus linearibus angustioribus setoso-pilosis, indumento densiore differt.

Frutex ramosus, 2-6 m. altus; rami ramulique dense stellato-tomentosi, annotini cicatricibus foliorum delapsorum tuberculati. *Folia* plerumque ovata, interdum lanceolata, interdum subtrilobata vel manifeste trilobata, usque ad 7.5 cm. longa et 4 cm. lata sed plerumque circiter 5 cm. longa et 2-2.5 cm. lata, apice obtusiuscula vel obtusiuscule acuminata, basi rotundata vel subtruncata vel interdum subcordata, marginibus subdistanter (interdum subdupliciter) serrata, serraturis acutis vel obtusiusculis, utrinque plus minusve pilis stellatis 2-5-radiatis et simplicibus intermixtis pubescentia vel fere glabra; petioli pubescentes, usque ad 2.5 cm. longi sed saepe breviores; stipulae dense pilosae, deciduae, lineari-lanceolatae, usque ad 7 mm. longae. *Flores* albidi, solitarii, ex axillis foliorum orti, versus apices ramorum aggregati; pedunculi graciles, dense stellato-pubescentes, usque ad 2.5 cm. longi sed saepissime 1-1.5 cm. longi. *Bractee* involucri 6-8, basi tantum coalitae, lineares, usque ad 1 cm. longae sed saepe breviores et calycem nunquam excedentes, saepissime setoso-pilosae et plus minusve pubescentes vel nonnunquam villosae. *Calyx* saltem 1 cm. longus, plerumque circiter 1.3 cm. longus, raro usque ad 1.5 cm. longus, extra pilis stellatis dense pubescens vel interdum lanato-tomentosus; lobi 3, inaequales, oblongo-ovati vel oblongi, acuti,

* Continued from K.B. 1937, 112.

† The two previous articles appeared in K.B. 1936, 1, and K.B. 1936, 387, under slightly different titles.

circiter 5 mm. longi. *Petala* 5, ambitu cuneato-obovata, circiter 4 cm. longa et 1.5–1.8 cm. lata, erecta, convoluta, superne altero latere oblique truncato cito angustata, apice oblique late obtuse cuspidato-rostrata, altero latere 5 mm. supra basin auricula* patente vel leviter recurva oblonga apice rotundata 5 mm. longa 3 mm. lata instructa, nonnunquam altero latere 2 mm. supra basin auricula usque ad 1 mm. diametro instructa, extra intusque glabra vel pilis paucis praedita, auriculis manifeste ciliatis. *Columna staminalis* circiter 5.5 cm. longa, praesertim apicem versus spirāliter torta, glaberrima, apicem versus antheris circiter 20 instructa, apice 5-dentata; filamenta filiformia, 2.3 mm. longa; antherae ellipsoideae, 1 mm. longae. *Stylus* exsertus, ramis 7–8 apice clavatis 4 mm. longis. *Ovarium* depresso-ovoideum, acutum, 2 mm. longum, 3 mm. diametro. *Fructus* rubri, depresso-globosi, apice umbilicati, 6 mm. longi, 8 mm. diametro, 5-costati, costis supralocularibus, 5-canaliculati, canaliculis interocularibus, sicco leviter transversim reticulati.

STATE OF MEXICO. District of Temascaltepec: Tejupilco, 1340 m., May 1932 (fl.), *Hinton* 690, "Grows in the forest, 3 m. high"; *ibid.*, May 1933 (fl.), *Hinton* 3928 (type), "On a stone fence, 3 m. high"; *ibid.*, July 1933 (fl.), *Hinton* 4289; *ibid.*, Oct. 1933 (fl., fr.) *Hinton* 5057, "On a stone fence, a shrub, 2 m. high."; *ibid.*, 1400 m., Dec. 1933 (fl.), *Hinton* 5371, "Common in barrancas, also introduced into gardens for the beauty of the snow-white flower"; *ibid.*, by the river, June 1935 (fl., fr.), *Hinton* 7912, "Shrub 6 m. high."

Vernacular name: *Monacillo*.

Mr. Hinton adds the notes that the fibre of this species is used as a textile for the manufacture of sacks, and also that fruiting specimens are very rare.

TILIACEAE (A. A. Bullock and T. A. Sprague).

***Triumfetta columnarioides* Bullock, sp. nov.**; peraffinis *T. columnari* Hochr. sec. Standl.† sed foliis minoribus supra minus pilosis subtus haud villosa-tomentosis, calyce extra brevissime plus minusve dense stellato-piloso haud longe piloso nec glabro differt.

Frutex 1.5–2 m. altus; rami ramosi, graciles, circiter 2 mm. diametro 4 dm. infra apicem, primum pilis stellatis minutis multiradiatis atque pilis longioribus simplicibus vel 2–3-radiatis leviter induti. *Folia* ovata, 3.5–7 cm. longa, 2–3.5 cm. lata, interdum leviter 3-lobata, apice longiuscule acuminata, basi truncata vel rotundata vel saepe leviter cordata, e basi 3–5-nervia, marginibus subdupliciter serrata, utrinque plus minusve pilis 1–3-radiatis hirsutula et in nervis venulisque pilis stellatis multiradiatis minutis

* This description of the auricles applies only to herbarium specimens which have been soaked in water and dissected; in life they are tightly convolute around the staminal column, and their function, unless it is simply the mechanical one of holding the petals vertically, is obscure.—A.A.B.

† Standley in Contrib. U.S. Nat. Herb. 23, 744 (1923).

leviter et irregulariter induta; petioli graciles, pilosi, 1-2.5 cm. longi. *Cymulae* 3-florae, simul axillares et laterales et oppositifoliae, apices ramorum versus plus minusve confertae; pedunculi satis dense pilosi, 5-7 mm. longi; pedicelli similes, 5-7 mm. longi, supra basin articulati; bracteae deciduae, lanceolato-subulatae, circiter 4 mm. longae. *Sepala* linearia, 2.5 cm. longa, 1.5-2 mm. lata, apice appendicibus 1.5-2 mm. longis coronata, extra pilis minutis stellatis multiradiatis satis dense induta, intus glabra. *Petala* ligulata vel superne leviter ampliata, acuta, circiter 2 cm. longa et 2 mm. lata, parte inferiore 2 mm. longa extra villosa intus apice linea villosa transversa praedita. *Androgynophorum* 2 mm. longum, glandulis 5 paullo brevioribus oblongis inter se distinctis praeditum, apice annulo distincto breviter ciliato coronatum. *Stamina* 20, filamentis filiformibus 1.8 cm. longis basin versus leviter villosis et ibidem leviter dilatatis, antheris oblongis 0.5 mm. longis. *Ovarium* globosum, 1 mm. diametro, dense echinulatum; stylus filiformis, fere 2 cm. longus, apice brevissime bifidus. *Fructus* (vix maturi) globosi, cum aculeis 8 mm. diametro, plus minusve minute puberuli sed aculeis glabris vel basin versus tantum puberulis; aculei numerosi, rigidi, recti, 3 mm. longi, apice spinula unica uncinati.

STATE OF MEXICO. District of Temascaltepec: Comunidad, 2350 m., Oct. 1933, *Hinton* 4891, "Oak woods, 2 m. high"; *ibid.*, 2300 m., Oct. 1933, *Hinton* 4917 (type), "Forest, 1.5 m. high. This collection is of different locality from No. 4891."

***Triumfetta heliocarpoides* Bullock**, sp. nov.; peraffinis *T. Galeottianae* Turcz., sed indumento multo brevior, foliis subtus albicantibus, floribus minoribus in inflorescentias ramosas dispositis, fructibus longius aculeatis, aculeis manifeste longioribus differt.

Frutex vel *suffrutex*, ramosus, 1-1.5 m. altus; rami ramulique pilis stellatis minutis tomentelli, medullosi, circiter 4 mm. diametro 20 cm. infra apicem, medulla 2 mm. diametro. *Folia* interdum subtrilobata, rotundato-obovata vel (superiora) ovata vel oblongo-ovata, inferiora usque ad 16 cm. longa et 11 cm. lata, superiora multo minora, apice acute acuminata vel acuta, basi satis profunde cordata vel (superiora) rotundata, subdupliciter serrata, e basi 5-7-nervia, supra pilis minutis stellatis satis dense puberula, viridia, nervis venisque haud prominentibus interdum leviter impressis, infra pilis similibus densissime induta, albicantia, nervis venisque prominentibus reticulata; petioli usque ad 10 cm. longi, superiores gradatim breviores, dense stellato-puberuli; stipulae pro genere magnae, lanceolatae, 6 mm. longae, 2 mm. latae, acutae, demum deciduae. *Flores* versus apicem ramorum in inflorescentias magnas thyrsoido-ramosas multifloras confertae; cymulae ultimae triflorae, pedunculis 4 mm. longis, pedicellis subaequilongis; rami ramulique inflorescentiarum dense stellato-tomentelli. *Alabastra* extra pilis minutis stellatis satis dense induta, 3-4 mm. longa, plus minusve clavata, infra medium leviter constricta, apice appendicibus vix

0.5 mm. longis coronata. *Sepala* linearia, superne leviter ampliata, 4 mm. longa, vix 1 mm. lata, apice acuta, intus glabra. *Petala* minuta, vix ultra 1 mm. longa et 0.5 mm. lata, obovata, apice rotundata dimidio inferiore extra villosa, intus medio linea transversa villosa, ceterum glabra. *Androgynophorum* circiter 0.75 mm. longum, glandulis 5 brevioribus distinctis oblongo-ellipticis praeditum, apice annulo angusto brevissime ciliato coronata. *Stamina* circiter 25, filamentis filiformibus basin versus brevissime pilosis 2-2.5 mm. longis, antheris oblongis circiter 0.3 mm. longis. *Ovarium* ovoideum, vix 0.5 mm. longum, vix echinulatum; stylus glaber, 1.5 mm. longus. *Fructus* ellipsoidei vel globosi, corpore ipso 3 mm. longo, 2-2.5 mm. diametro, glabro; aculei pro rata pauci (circiter 20), recti, glabri, 3-5 mm. longi, spinula unica uncinata terminati.

STATE OF MEXICO. District of Temascaltepec: Ixtapan, 1000 m., Nov. 1933 (fl., young fr.), *Hinton* 5159 (type), "Shrub 1 m. high"; *ibid.*, on a hill, Nov. 1934 (fr.), *Hinton* 7001, "Shrub 1.5 m. high"; Tejupilco, in a barranca, Oct. 1934 (fl.), *Hinton* 6779, "Shrub 1.5 m. high"; *ibid.*, Oct. 1934 (fl.), *Hinton* 6780, "Shrub 1 m. high."

Vernacular name: *Guasima*.

***Triumfetta Hintonii* Sprague**, sp. nov.; fructibus oblongo-ellipsoideis, aculeis paucis brevibus incurvis perdistincta.

Frutex 2.5-4 m. altus, caule inferne circiter 2 cm. diametro, cortice areolis rhomboideis elevato-reticulato; ramuli graciles, 3-4 mm. diametro 4-6 dm. infra apicem, superne stellato-puberuli, inferne glabrati; internodia 3-5 cm. longa. *Folia* anguste ovata usque lanceolata, manifeste acute acuminata, in basin perangustam subtruncatam vel subcordatam plus minusve cuneata, 3-8 (11) cm. longa, 1-3.5 (4.5) cm. lata, tenuiter herbacea, basi 5-nervia, nervis ceteris utrinque circiter 3, crebre subdupliciter serrata, supra pilis sparsis stellatis atque simplicibus basi bulbosis puberula, subtus mesophyllo minute punctato, venulis nervisque fulvo-stellato-puberulis, nervis subtus inferne necnon supra axillos venarum lateralium pilis simplicibus albidis patule hirsuta; petioli (0.3) 0.5-2.5 cm. longi, purpurei, pilis fulvis stellatis furfuraceo-pubescentes vel puberuli. *Ramuli floriferi* graciles, acute ascendentes, 1-4 dm. longi, bracteis foliaceis anguste lanceolatis vel oblongo-lanceolatis 1.5-4 cm. longis 0.4-1 cm. latis; cymulae triflorae, pedunculatae, usque quaternae juxta folia; pedunculi plerumque 3-5 mm. longi, pedunculus unus quisque juxta folium interdum bracteis foliaceis inferius instructus, cymulas circiter 4 gerens; pedicelli 2.5-4 mm. longi, infra medium articulati, minute stellato-pubescentes. *Alabastra* matura 9-10 mm. longa, inferne ampliata, deinde leviter constricta, superne angustata, appendiculis circiter 0.3 mm. longis. *Sepala* 10 mm. longa, medio 0.7 mm. lata, extra minute stellato-puberula, inferne sparse tantum, in insertionem valde incurva; pars inferior ampliata, convexa, oblongo-elliptica, vix ultra 2 mm. longa, intus a basi per 1.5 mm. glabra marginibus stellato-pubes-

centibus exceptis; sepalum intus deinde per 1.5 mm. densiuscule stellato-pubescent, ceterum glabrum; pars superior linearilanceolata, apiculo 0.4 mm. longo. *Petala* vix 7 mm. longa, brevissime anguste unguiculata; pars basalis sursum sensim ampliata, apice 0.8 mm. lata, extra breviter villosa, intus linea villosa a parte superiore disjuncta; pars superior oblanceolata, 4.5 mm. longa, 1.5–1.7 mm. lata. *Androgynophorum* cum annulo vix ultra 1 mm. longum; glandulae subquadratae, 0.6 mm. longae et latae, fere contiguae; annulus 0.3 mm. altus, breviter ciliatus. *Stamina* 16–19; filamenta usque ad 8 mm. longa, glabra; antherae 0.7 mm. longae. *Ovarium* breviter oblongo-ellipsoideum, glabrum, biloculare, tuberculis spinuliferis circiter 11–14 echinatum; spinula cum tuberculo suo 0.4 mm. longa; stigmata 2. *Fructus* oblongo-ellipsoidei, 6 mm. longi, 3.5 mm. diametro, pro genere sparse aculeati, triente inferiore inermes, glabri, viridi-fusci; aculei incurvo-ascendentes, circiter 1 (– 1.5) mm. longi.

STATE OF MEXICO. District of Temascaltepec: La Labor, 2000 m. fr. July, *Hinton* 980; *ibid.*, by the water, fl. and fr. May, *Hinton* 3837, 3883; *ibid.*, fl. Oct., *Hinton* 6594; Cajones, on a hill, 2480 m., fl. July, *Hinton* 4224; Nanchititla, by the water, fr. Dec., *Hinton* 5324; Cumbre de Tejupilco, in oak woods, fl. Nov., *Hinton* 7018 (type); Pantoja, in oak woods, fr. Nov., *Hinton* 7027.

Triumfetta Purpusii Standl. in Publ. Field Mus. Chicago, Bot. Ser. 11, 167 (1936).

STATE OF VERA CRUZ. Matazaeza, March 1923 (fl., fr.), *Purpus* 9009 (type in Field Mus. Herb., fragment in Kew Herb.); rocky places near Rancho Remudadero, Feb. 1930 (fl., fr.), *Purpus* 13065 (Kew Herb.).

Standley cited also *Purpus* 11099 from Remudadero, but this specimen, apparently, has been mislaid. The type was kindly sent on loan from the Field Museum to Kew, where comparison of *Purpus* 13065 with the description had revealed certain discrepancies. The sepal appendages in the type are 7–8 mm. long, those in the Kew specimen only 4–5 mm. long. Of the petals, Standley says "... lineariligulata sepalis subaequalia." The petals in the Kew specimen, on dissection of a bud just before anthesis, were found to be broadly obovate, and only half as long as the sepals, but re-examination showed that this was a juvenile state, and that on anthesis the petals elongate without, however, increasing in width. They thus become oblanceolate or oblanceolate-spathulate, and about three quarters of the length of the sepals. Standley's "sepalis subaequalia" is, I think, a little misleading, though it must be admitted that in all the open flowers on the type the petals are very withered, and extremely difficult to dissect satisfactorily.—A. A. B.

Triumfetta quercetorum Bullock, sp. nov.; habitu (quoad ramulos abbreviatis) *T. Palmeri* S. Wats. accedens, sed foliis plerumque minoribus minus pilosis tenuioribus, serraturis regularibus

minus profundis, calyce pilis minutis stellatis satis dense induto haud villosa-tomentoso recedit; a *T. columnari* Hochr. foliis brevius petiolatis angustioribus haud basi cordatis minus pilosis, calyce minute stellato-piloso nec pilis paucis simplicibus atque stellatis intermixtis leviter pubescente facile distinguenda; a *T. longicuspide* Turcz. habitu graciliore, foliis minoribus brevius petiolatis, ramulis abbreviatis ex axillis foliorum exortis, floribus minoribus, calyce satis dense minute stellato-piloso appendicibus brevioribus, androgynophoro longiore recedit.

Frutex 1-3 m. altus; rami teretes, graciles, 2-3 mm. diametro 4 dm. infra apicem, ramosi, ramulos abbreviatis foliatis axillares gerentes, novelli pilis minutis stellatis satis dense induti. *Folia* lanceolata usque ovata, plerumque 4-9 cm. longa, 1.5-3 cm. lata, apice longiuscule acuminata, basi obtusa vel rotundata, e basi 3-nervia, utrinque plus minusve pilis satis rigidis hirsutula et in nervis venisque praesertim pilis minutis stellatis leviter pilosa, serrata, serraturis acutis vel obtusis et saepe glanduliferis; petioli circiter 5 mm. (usque ad 1 cm.) longi. *Inflorescentiae* versus apices ramorum confertae, pluriflorae, nonnunquam bracteas foliaceas 1-2 gerentes, cymulis ultimis trifloris fasciculatis vel pedunculatis; pedunculi nulli vel usque ad 3-5 cm. longi; pedicelli circiter 6 mm. longi, sicut pedunculi minute stellato-pilosi; bracteae parvae, lineares, mox deciduae. *Alabastra* 1.5-2 cm. longa, subcylindrica, inferne leviter ampliata, minute stellato-pilosula, appendicibus subulatis 1 mm. longis coronata. *Sepala* 5, intus glabra, linearia, 1 mm. lata, basin versus levissime latiora et ibidem breviter ciliata. *Petala* 5, parte inferiore 2-5 mm. longa lineari breviter villosa, parte superiore lineari-oblancoolata acuta 7-5 mm. longa glabra. *Androgynophorum* 1-5 mm. longum, glandulis 5 distinctis oblongo-ellipticis paullo brevioribus praeditum, apice annulo angusto glabro coronatum. *Stamina* 20, filamentis 1-5 cm. longis filiformibus basin versus levissime ampliatis et ibidem breviter villosis, antheris oblongis 1 mm. longis. *Ovarium* globosum, 1 mm. diametro, echinulatum, stylo filiformi 1-2 cm. longo apice brevissime bifido. *Fructus* echinati, cum aculeis usque ad 1 cm. diametro, plus minusve puberuli; aculei numerosi, rigidi, plus minusve arcuato-recurvi, 2-3 mm. longi, spinula unica recta ascendente vel plus minusve recurva terminati.

STATE OF MEXICO. District of Temascaltepec: Rincón del Carmen, 1340 m., Oct. 1932, *Hinton* 1935, "By the water, 1 m. high"; Nanchititla, Jan. 1933, *Hinton* 3082, "Oak woods, 3 m. high"; *ibid.*, Oct. 1933, *Hinton* 4962, "Oak woods, 1-5 m. high"; Pungarancha, 950 m., Nov. 1935, *Hinton* 5253, "Oak woods"; *ibid.*, Oct. 1934, *Hinton* 6746 (type), "1 m. high, see 5253 from same place"; Ypericones, Nov. 1934, *Hinton* 6996, "Oak woods, 1-5 m. high."

MALPIGHIACEAE (A. A. Bullock).

Byrsonima crassifolia (Linn.) H. B. K. Nov. Gen. et Sp. 5, 149 (1822); Standl. in Contrib. U.S. Nat. Herb. 23, 564 (1923);

Nieden zu in Engl. Pflanzenr. Malpigh. 718 (1928) ; Morton in Publ. Carnegie Inst. Washington, No. 146, 140 (1936).

STATE OF MEXICO. District of Temascaltepec : El Picacho (mountain near Tejupilco), 1600 m., June 1932, *Hinton* 717, "Shrub 4 m. high ; the fruit is common in the markets" ; San Lucas del Maiz, Feb. 1933, *Hinton* 3324 ; Tejupilco, March 1932, *Hinton* 445 ; *ibid.*, 1340 m., July 1933, *Hinton* 4382.

STATE OF GUERRERO. District of Coyuca : Pungarabato, on a hill, April 1934, *Hinton* 5950, "A shrub 2 m. high."

Vernacular names : *Nanche*, *Nanche de Zorro*.

Although Nieden zu described numerous forms of this very variable and widely distributed plant he evidently had not the opportunity of examining all the material at Standley's disposal, for he maintained, in addition to *B. crassifolia*, all the species which Standley had rightly reduced as being founded on characters which are not correlated and which are normally variable ; this view was also maintained by Morton. The reduced species were *B. cotonifolia*, H. B. K., *B. oaxacana* Juss. and *B. Karwinskiana* Juss.

Malpighia puniceifolia L. Sp. Pl. ed. 2, 609 (1762) ; Small in N. Amer. Fl. 25, 156 (1910) ; Standl. in Contrib. U.S. Nat. Herb. 23, 566 (1923) ; Nieden zu in Engl. Pflanzenr. Malpigh. 622 (1928).

STATE OF GUERRERO. District of Coyuca : Coyuca—Querendas, in a barranca, June 1934, *Hinton* 6132.

Nieden zu records this plant from Oaxaca and Yucatan, in addition to its range in the West Indies and northern South America. Its distribution in Mexico evidently requires further investigation.

Malpighia Hintoni Bullock, sp. nov. ; affinis *M. cordatae* Small, sed foliis multo majoribus supra fere glabris subtus adpresso-pilosis vix tomentosis, floribus minoribus ut videtur numerosioribus, tubo staminali 1 mm. (nec 4 mm.) longo facile distinguenda.

Frutex "2.5 m. altus" (*Hinton* 4489, 4736), vel "*arbor* 5 m. alta" (*Hinton* 8051), vel "*arbor magna*" (*Hinton* 1192) ; ramuli novelli villosi-tomentosi, demum cortice fibroso griseo-brunneo induti. *Folia* opposita, rotundato-elliptica vel latissime elliptica, nonnunquam plus minusve late obovata, usque ad 10 cm. longa et 8 cm. lata (*Hinton* 1192), vel circiter 7 cm. longa et 4.5 cm. lata (*Hinton* 4489), apice rotundata vel acutiuscula, nonnunquam breviter late cuspidata, basi late rotundata, vix truncata vel subcordata, supra glabra vel in costa et nervis tantum pubescentia, subtus persistenter pubescentia vel villosa vel lanata, vix tomentosa, costa et nervis lateralibus (utrinsecus circiter 6) arcuato-adscendentibus prominentibus ; petioli tomentosi, circiter 5 mm. longi, eglandulosi. *Racemi* in axillis foliorum solitarii vel bini, floribus apicem versus in axillis bractearum dense confertis ; pedunculi tomentosi, sub anthesin 1-1.3 cm. longi, nonnunquam longiores, medio bracteis 2 foliaceis oppositis instructi ; pedicelli ex axillis bractearum orti, oppositi vel 3-4-nati verticillati, tomentosi, circiter 1 cm. longi, infra medium vel basin versus bracteolis

2 oppositis vel suboppositis instructi; bracteae atque bracteolae triangulares vel subulatae, acutae, usque ad 3 mm. longae, tomentosae. *Sepala* ovata, 3–4 mm. longa, 2 mm. lata, apice obtusiuscula, basi glandulis 2 carnosis glabris lateralibus dimidio brevioribus praedita, extra ceterum villosa-pilosa, intus minute papillosa, in insertionem valde incurva, superne sub anthesin inter petala incurva. *Petala* unguiculata, patentia; unguis carnosus, 3 mm. longus; lamina rotundato-obovata, 6–7 mm. longa, 5–6 mm. lata, marginibus fimbriata, extra intusque glabra. *Stamina* 10; filamenta applanata subulata, basi in tubum 1 mm. longum coalita, partibus liberis circiter 0.75 mm. longis; antherae oblongae, 1.5 mm. longae, 0.75 mm. latae, introrsum dehiscentes. *Ovarium* ovoideum vel ovoideo-globosum, 2 mm. longum, 2 mm. diametro, glabrum, apice stylis 3 carnosis 2 mm. longis coronatum, stylo uno quam ceteris tenuiore. *Fructus* immaturi globosi, 6 mm. diametro.

STATE OF MEXICO. District of Temascaltepec: Vigas, 1080 m., July 1932, *Hinton* 1192 (type); Luvianos, July 1933, *Hinton* 4489; Limones, 910 m., Sept. 1933 (young fr.), No. 4736; *ibid.*, July 1935 (fl.), No. 8051.

This species does not fit into any part of Standley's key in his "Trees and Shrubs of Mexico" (p. 565) and is easily distinguished from all the species which he lists by its large broadly ovate or rotundate leaves, which are almost glabrous above but densely adpressed-hairy below. The loan of the type of *M. cordata* Small, from the United States National Herbarium, is gratefully acknowledged.

Thryallis Palmeri Rose in Contrib. U.S. Nat. Herb. 12, 281 (1909); Small in N. Amer. Fl. 25, 151 (1910); Standl. in Contrib. U.S. Nat. Herb. 23, 569 (1923). *Galphimia glandulosa* Rose in Contrib. U.S. Nat. Herb. 5, 137 (1897), non Cav. (1797). *G. paniculata* Bartl. var. *glandulosa* (Rose) Niedenzu in Engl. Pflanzenr. Malpigh. 599 (1928).

STATE OF GUERRERO. Near Acapulco, Oct. 1894–March 1895 (fl.), *Palmer* 474 (type in U.S. Nat. Herb.).

STATE OF MEXICO. District of Temascaltepec: Pineda, on a hill, Jan. 1933, *Hinton* 3195; Nanchititla, on a hill, Feb. 1933, *Hinton* 3411; *ibid.*, in an oak forest, Feb. 1935, *Hinton* 7354; Platanal, in oak woods, March 1934, *Hinton* 5749; Palmar, on a hill, March 1935, *Hinton* 7528.

According to the literature cited above, this plant was previously known only from the type collection, so that Mr. Hinton's specimens, which match the type, constitute an important new record of the species. It is a suffruticose plant up to a metre in height, the annual (?) stems arising from a thick, woody rootstock. The type specimen in the United States National Herbarium, was kindly sent on loan to Kew for comparison with Mr. Hinton's specimens.

Heteropteris* portillana S. Wats. in Proc. Amer. Acad. 22, 402 (1887); Niedenzu in Engl. Pflanzenr. Malpigh. 312 (1928). *Banisteria*

* The generic name *Heteropteris* A. Juss. is conserved.

portillana (S. Wats.) C. B. Robinson ex Small in N. Amer. Fl. **25**, 135 (1910); Standl. in Contrib. U.S. Nat. Herb. **23**, 577 (1923).

STATE OF MEXICO. District of Temascaltepec: Salitre, 1300 m., Dec. 1932, *Hinton* 3003.

This species was known previously only from the *locus classicus*, near Guadalajara in the State of Jalisco, where both Palmer and Pringle collected it. Niedenzu in a note says "Haec species antecedenti [*Heteropterys Gayana* Juss.] maxime affinis est, forsans subspecies cum ipsa conjungenda." The two species are, however, readily separable, by the various key characters given by Niedenzu and Standley respectively.

Heteropteris cotinifolia Juss. in Ann. Sc. Nat. Sér. II. **13**, 274 (1840); Niedenzu in Engl. Pflanzenr. Malpigh. 311 (1928). *Banisteria cotinifolia* (Juss.) C. B. Robinson ex Small in N. Amer. Fl. **25**, 134 (1910); Standl. in Contrib. U.S. Nat. Herb. **23**, 577 (1923). *Heteropteris pallida* Brandeg. in Univ. Calif. Publ. Bot. **6**, 182 (1915). *Banisteria pallida* (Brandeg.) Standl. *l.c.*

STATE OF OAXACA. Totolapa, Aug. (fl.), *Andrieux* 492 (type number, in Kew Herb.).

STATE OF GUERRERO. Iguala, Aug. 1905 (fl.), *Rose, Painter and Rose* 9426. District of Coyuca: Balderrama, Aug. 1934 (fl.), *Hinton* 6496; *ibid.* (from the same vine), Oct. 1934 (fr.), *Hinton* 6867.

A portion of Mr. Hinton's number 6867 was submitted to Dr. C. V. Morton, of the United States National Herbarium, for examination and comparison with the material at his disposal, and he replied, "Hinton 6867 and *Rose, Painter and Rose* 9426 are close matches for the type of *Banisteria pallida* (Brandeg.) Standl., and are undoubtedly referable to that species. I am unable to say whether or not Niedenzu is correct in considering *B. pallida* the same as *B. cotinifolia*, but it seems likely that that is true."

The writer has now carefully compared *Hinton* 6496 and 6867 with the type material of *H. cotinifolia* at Kew and concludes that they are conspecific.

Heteropteris Gayana Juss. in Ann. Sc. Nat. Ser. II. **13**, 274 (1840); Niedenzu in Engl. Pflanzenr. Malpigh. 312 (1928) quoad formam typicam Niedenzu, *l.c.* tantum. *Banisteria Gayana* (Juss.) C. B. Robinson ex Small in N. Amer. Fl. **25**, 135 (1910), quoad nomen tantum; non Standl. in Contrib. U.S. Nat. Herb. **23**, 577 (1923).

STATE OF OAXACA. Guichiloma, between Tehuantepec and Guazacualcos River, Sept. (fr.), *Andrieux* 494 (type number in Kew Herb.).

Some doubt having arisen as to the validity of the treatment of this species by Small, Standley, and Niedenzu, a few samaras of *Andrieux* 494 were sent to Dr. Morton for comparison with material called "*B. Gayana*" in the United States National Herbarium. He replied, "The samaras of *Andrieux* 494, the type of *Banisteria*

Gayana, are not matched in the U.S. National Herbarium. You are quite right that the species treated by Standley and also by Small as *B. Gayana* is different and is *H. [Heteropteris] Gayana* f. *acapulcensis* Ndzu. pro parte. It is, I believe, more than a mere form and deserves specific rank. . . .”

The present writer concludes that *H. Gayana*, *sensu stricto*, has never been found since the type collection was made by Andrieux over a hundred years ago.

Heteropteris Palmeri Rose in Contrib. U.S. Nat. Herb. 1, 311 (1895). *Banisteria Palmeri* (Rose) C. B. Robinson ex Small in N. Amer. Fl. 25, 135 (1910); Standl. in Contrib. U.S. Nat. Herb. 23, 577 (1923). *B. Gayana* Small in N. Amer. Fl. 25, 135 (1910); Standl. in Contrib. U.S. Nat. Herb. 23, 577 (1923); non *Heteropteris Gayana* Juss. (1840). *H. Gayana* forma *acapulcensis* Niedenzu in Engl. Pflanzenr. Malpigh. 312 (1928), saltem partim.

STATE OF SONORA. Alamos, Sept. 1890 (fl. fr.), *Palmer* 655, 656 (co-type numbers in Kew Herb.).

STATE OF SINALOA. S. Ignacio, 450 m., May 1921 (fl.) *Ortega* 536; *ibid.*, 95 m., May 1921 (fr.), *Ortega* 641.

STATE OF COLIMA. Manzanillo, Dec. 1890 (fr.), *Palmer* 1025.

STATE OF GUERRERO. Acapulco, Oct. 1894–March 1895 (fr.), *Palmer* 79.

The above treatment of *Heteropteris Palmeri* is based on the specimens at Kew, and on Dr. Morton's memorandum cited (in part) under *H. Gayana* above. It will be observed that its range includes almost the whole of the west coast of Mexico.

Mascagnia polybotrya (Juss.) Niedenzu in Arb. Bot. Inst. Lyc. Braunsberg, 3, 5 (1908), et in Engl. Pflanzenr. Malpigh. 94 (1928); Small in N. Amer. Fl. 25, 120 (1910); Standl. in Contrib. U.S. Nat. Herb. 23, 574 (1923). *M. Gouania* Small, l.c.; Standl. l.c. *Hiraea polybotrya* Juss. in Ann. Sc. Nat. Sér. 2, Bot. 13, 260 (1840).

STATE OF MEXICO. District of Temascaltepec: Chorrera, 1230 m., Nov. 1932, *Hinton* 2631; Salitre, 1350 m., Nov. 1932, *Hinton* 2595; Limones, Nov. 1934, *Hinton* 6990.

Mr. Hinton's notes indicate that this is either a liane sprawling over other trees, or a shrub with pendulous branches.

There seems to be no adequate means of separating Small's *M. Gouania* from Jussieu's plant, the diagnostic characters given by both Small and Standley being found to be too variable. Standley was not thoroughly satisfied as to the validity of Small's species, for under *M. polybotrya* he says, "No material seen by the writer; perhaps the same as *M. Gouania*."

Mascagnia dipholiphylla (Small) Bullock, comb. nov.—*Hiraea dipholiphylla* Small in N. Amer. Fl. 25, 122 (1910); Standl. in Contrib. U.S. Nat. Herb. 23, 572 (1923); Niedenzu in Engl.

Pflanzenr. Malpigh. 144 (1928), sub spp. incertae. *Mascagnia polycarpa* T. S. Brandeg. in Univ. Calif. Publ. Bot. 10, 409 (1924).

STATE OF VERZ CRUZ. Remudadero, April 1923 (fr.), *Purpus* 9019 (type of *M. polycarpa* in Univ. Calif. Herb.).

STATE OF MORELOS. Near Cuernavaca, 1500 m., Mar. 1899, *Pringle* 7730 (type, in Gray Herb.).

STATE OF MEXICO. Pungaranchó, by the river, Jan. 1933, *Hinton* 3147; Tenayac, 1450 m., Feb. 1933, *Hinton* 3314; Guayabal, by the river, Feb. 1933, *Hinton* 3370; *ibid.*, from the same vine, March 1935, *Hinton* 7523; Limones, Jan. 1934, *Hinton* 5569; Chorrera, 1230 m., on a dry hill, March 1934, *Hinton* 5744; *ibid.*, in a barranca, March 1935, *Hinton* 7513; Ixtapan, in a barranca, March 1935, *Hinton* 7498. Without locality, *Parkinson* s. n. (in Herb. Hook. and Herb. Benth.).

This is reported also from Oaxaca by Standley, but I have seen no specimens from that State. The type specimen, kindly sent on loan to Kew by the authorities at the Gray Herbarium, is matched very exactly by Mr. Hinton's numbers 7498 and 7513, both of which have flowers and fruit. Thanks are also due for the loan of the type of *M. polycarpa* from the herbarium of the University of California.

Nieden zu apparently did not see this plant, for he included it under "uncertain species," with the note, "Num revera *Hiraea*?"

In support of the above transference, it may be noted that the stipules are borne at the base of the petiole, the only character used by Small and Standley in their keys to the genera, though not one regarded as crucial by Nieden zu; in addition, the inflorescence and leaves are those of a *Mascagnia* and the plant is indeed closely allied to *M. macroptera* (Sessé et Moc.) Nieden zu. Morton (in Publ. Carnegie Inst. Washington, no. 461, 127: 1936) separates *Mascagnia* and *Hiraea* by the following key characters:—

"Stipules borne on the stems; flower stalks articulate and bibracteolate above the base.....	<i>Mascagnia</i>
Stipules borne on the petioles; flower stalks not articulate, bibracteolate at the base.....	<i>Hiraea</i> ."

The present plant shows that these characters are not mutually exclusive: it has "stipules borne on the stem" as for *Mascagnia*, and "flower stalks not articulate, bibracteolate at the base," as for *Hiraea*.

Gaudichaudia cynanchoides H. B. K. Nov. Gen. et Sp. 5, 158, t. 445 (1822); Small in N. Amer. Fl. 25, 129 (1910); Standl. in Contrib. U.S. Nat. Herb. 23, 571 (1923); Nieden zu in Engl. Pflanzenr. Malpigh. 239 (1928). *H. mucronata* (Sessé et Moc. ex DC.) Juss. in Ann. Sc. Nat. Sér. 2, Bot. 13, 253 (1840); Small l.c. 130 (1910); Standl. l.c.

STATE OF MEXICO. District of Temascaltepec: Rincón, 1960 m., Sept. 1932, *Hinton* 1704; Cumbre, 2485 m., Sept. 1932, *Hinton* 1695; Tejuipilco, 1340 m., Oct. 1932, *Hinton* 2289.

There seems to be no reason for maintaining both *G. cynanchoides* and *G. mucronata*, and inspection of the plate and description of *G. cynanchoides* shows that Small's key diagnosis "Leaf-blades sessile or nearly so, narrowed to the base" is an error which Standley repeated. Morton (in Publ. Carnegie Inst. Washington, No. 461, 129: 1936) points out that Standley's identification of *G. mucronata* in Yucatan is also faulty, so that the specimens he examined had probably become mixed and written up in error. Niedenzu's treatment, as far as the species go, is followed here, but the named varieties and forms which he enumerates are not, in the present writer's opinion, distinct taxonomic entities.

Gaudichaudia mollis Benth. Pl. Hartw. 6 (1839); Niedenzu in Engl. Pflanzenr. Malpigh. 244 (1928).

STATE OF MEXICO. District of Temascaltepec: Ixtapan, 1000 m., July 1932, *Hinton* 1170; *ibid.*, Sept. 1932, *Hinton* 1634.

Both Small and Standley list this as a doubtful species, whilst Niedenzu divides it into two varieties, of which I have seen only var. *Hartwegiana* Niedenzu. The description of this (the type) does not seem to be sufficiently distinct from that of var. *Pringleana* Niedenzu to warrant separate treatment.

LEGUMINOSAE (N. Y. Sandwith).

Nissolia leiogyne Sandwith, sp. nov.; *N. Schottii* (Torr.) A. Gr. affinis, forma foliolorum, dentibus calycinis multo brevioribus, gynoeceo fructuque maturo glaberrimis differt; *N. Pringlei* Rose atque *N. diversifolia* Rose forma foliolorum, indumento calycis gynoecei fructus differunt.

Suffrutex scandens esetosus, ramulis gracilibus omnino glabris vel novellis inconspicue pubescentibus. *Stipulae* anguste lanceolato-subulatae, 2.5–4 mm. longae. *Folia* adulta glaberrima; petiolus 0.6–2.4 cm. longus; internodia rhacheos 0.4–1.5 cm. longa; petioluli vulgo 1–2 mm. longi; foliola 5, late obovata, rarius obovato-elliptica, saepius obcordata apice late rotundata retusa vel truncata, rarius rotundata tantum, semper ad 1 mm. mucronata, basin versus saepius attenuata sed basi ipsa rotundata vel saltem obtusa, magnitudine valde variabili, 0.3–2.3 cm. longa, 0.3–1.9 cm. lata, adulta chartacea, glaberrima, supra punctata, nervis lateralibus utroque costae latere 5–6, rete venularum in foliolis majoribus subtus manifesto intricato plano fere impresso. *Flores* axillares in quaque axilla usque 6, siccitate ad 8 mm. longi; bractaeae basi pedicellorum subulatae, 1–2 mm. longae, pubescentes; pedicelli gracillimi, ad 7 mm. longi, glabri. *Calyx* tubo campanulato 2.5 mm. longo atque lato glabro; dentes subulati, 0.75–1.25 mm. longi. *Petala* lutea; vexillum cum ungue 8–9 mm. longum, ungue 1.5–1.8 mm. longo superne obscure ciliato, lamina applanata ovata 6–7.5 mm. longa 5–6 mm. lata basi rotundata haud auriculata ciliata extra praesertim inferne prope medium puberula vel glabrescente; alae ungue 3 mm.

longo dimidio superiore dense ciliato-piloso, lamina oblongo-lanceolata 5.5–7 mm. longa 2–2.3 mm. lata; carinae petala laminis dorso cohaerentibus, ungue 2.75–3 mm. longo glabro, lamina 5–6.5 mm. longa 2 mm. lata basi obscure ciliata. *Stamina* 5–5.5 mm. longa, vagina filamentisque glabris. *Gynoecium* omnino glaberrimum; ovarium lineari-oblongum, 2.5–3 mm. longum, vix 0.6 mm. latum, stipite 0.5 mm. longo, sensim in stylum 1.5–2 mm. longum attenuatum; ovula 2. *Fructus* totus 2.5–3 cm. longus, stipite ad 3.5 mm. longo, plus minusve falcato-curvatus, glaberrimus, articulis 1–2 valde costatis, inter articulos haud constrictus, ala articuli superioris conspicue reticulato-venosa apice acuta fere ad 8 mm. lata, stylo terminali.

STATE OF GUERRERO. District of Coyuca: Santa Barbara, in barranca, fl. and fr. July 14th, 1934, *Hinton* 6291 (typus); Chacamero, fr. Sept. 19th, 1934, *Hinton* 6616; Tario, fl. June 11th, 1935, *Hinton* 7861. "Vine. Flowers yellow."

Caesalpinia (Poincianella) Hintoni *Sandwith*, sp. nov.; *C. melanadeniae* (Rose) Standley affinis, foliis multo majoribus, pinnis 9, foliolis in quaque pinna 10–12 dense nitenter pubescentibus fere subsericeis, racemo longo conspicuo multifloro, pedicellis longioribus, fructu majore facile distinguitur.

Frutex elatus, 4 m. altus, inermis, ramulis summis lignosis robustis cortice pruinoso-cinereo obtectis. *Folia* vulgo 9–15 cm. longa, gracilia, glandulis parvis nigrescentibus conspersa; petiolus glaber, 2.8–5 cm. longus; rhachis glabra vel sursum sparse pilosula; pinnae 4-jugae cum summa terminali, molliter pilosulo-pubescentes, 2–3.5 cm. longae, petiolo vulgo 6–9 mm. longo; foliola 4–6-juga, sese conspicue imbricantia, obovato-oblonga vel oblonga, apice rotundata, 6–12 mm. longa, 3–6.5 mm. lata, marginibus utrinque glandulis nigris crebris conspicue maculata, utrinque pilis cinereis nitentibus dense molliter pubescentia, juniora fere subsericea, costa supra canaliculato-impressa subtus prominente, nervis ceteris vix cernendis. *Inflorescentia* racemosa vel basi paniculata, conspicua, 15–20 cm. longa (forsan longior), racemis ut videtur circiter 30–40-floris, ubique pilis cinereis patentibus pubescens atque glandulis brevistipitatis satis copiose praedita; pedicelli graciles, saepius subhorizontaliter patentes, apice in alabastrum saepe sursum arcuati, evoluti 0.8–1.4 cm. longi, apicem versus articulati. *Alabastra* siccitate rubro-purpurea. *Calycis* tubus late turbinatus, circiter 2 mm. longus, apice 5 mm. latus; sepala oblonga vel ovata, obtusa, 7 mm. longa, 3.8–5 mm. lata, extra dense pubescentia et praesertim marginibus stipitato-glandulosa. *Petala* ungue pubescente 1–1.5 mm. longo, lamina glabra ovata vel ovato-elliptica obtusa 7 mm. longa 3.8–5 mm. lata. *Stamina* arcuata; filamenta circiter 8.5 mm. longa, igitur petala subaequantia, dimidio inferiore crassa carnea uno latere dense pubescentia, superiore attenuata glabra sed glandulis magnis flavis poculiformibus stipitatis praedita;

antherae circiter 1.5 mm. longae. *Ovarium* circiter 2 mm. longum, marginibus villosopubescens, paginis glandulis flavis sessilibus praeditum; stylus superne saltem glaber, 3–4 mm. longus. *Fructus* falcatus, 4–6 cm. longus, 1.2–1.5 cm. latus, ei *C. melanadeniae* similis, siccitate pallide brunneus, et dense pubescens et glandulis obscure brunneis crebris sessilibus vel subimmersis maculatus; pedicelli fructiferi vulgo 1.5 cm. longi.

STATE OF GUERRERO. District of Coyuca; Cuajilote, by trail, fl. and fr. Jan. 29th, 1934, *Hinton* 5567; leaves and fr. from same tree, May 9th, 1935, *Hinton* 7746 (typus). "Shrub, 4 m. high."

Vernacular name: *Trompetilla*.

Inga (Series **Pilosiusculae**) **Hintoni** *Sandwith*, sp. nov.; *I. Pringlei* Harms (? *I. Schiedeanae* Steud.) affinis, foliolis vulgo haud acuminatis, bracteis parvis quam alabastris multo brevioribus, calyce necnon dentibus suis brevioribus, corolla brevior differt.

Arbor parva, ramulis annotinis cinereis crebre lenticellatis, hornotinis dense ferrugineo-vel fulvo-pilosulis. *Folia* pro rata parva, inferiora ad 20 cm. longa, superiora 8–15 cm. longa, petiolo costa rhacheos petiolulis colore ramulorum dense pilosulis; petiolus nudus, 0.7–2 cm. longus; internodia rhacheos 1–2.5 cm. longa, alis conspicuis glabrescentibus vel ciliato-pilosulis; glandulae parvae sessiles vel stipitatae, ore parvo vel etiam obsoleto, saepe flavescens; petioluli brevissimi, ad 1.5 mm. longi; foliola 4–5-juga vel summa saepius 2–3-juga, oblongo-lanceolata vel elliptico-lanceolata vel elliptica, ima nonnunquam oblongo-ovata, apice obtusa apiculata vel acuta, raro acuminata, basi rotundata et saepius levissime cordata, ima 2–4.5 cm. longa, ad 2.1 cm. lata, summa 4–12.5 cm. longa, 1.5–4.4 cm. lata, coriacea, supra nitidula, juventute praesertim costa nervis marginibusque pilosula, saepe demum glabra, nervis primariis lateralibus utroque costae latere 10–15 supra vix prominulis vel planis subtus prominentibus, rete venularum supra prominulo vel impresso subtus prominulo, areolis subtus manifestis. *Inflorescentiae* ex axillis exorientes 1–3; pedunculi nudi 1.5–3 cm. longi, dense ferrugineo-vel fulvo-pilosuli. *Spicae* densae, oblongo-ovoideae, 1.5–3 cm. longae, floribus sessilibus; bractee spathulato-lineares, extra pilosulae, 2.2–2.5 mm. longae, basibus conicogibbosis exceptis caducae. *Alabastra* pyriformia, ferruginea vel fulva. *Calyx* subtubularis, basi contractus atque substipitatus, totus 4.5–5 mm. longus, extra tubo sparse dentibus densius subadpresse pilosulus, unilateraliter fissus; dentes triangulares acuti, circiter 0.75 mm. longi. *Corolla* tota 7 mm. longa, inferne cylindrica glabrescensque, sursum aliquantum ampliato-campanulata ac extra adpresse ferrugineo-pubescens; lobi ovato-deltoides vel fere lanceolati, 2.3–2.5 mm. longi, 1.3–1.5 mm. lati. *Tubus staminalis* inclusus. *Ovarium* glabrum; stylus glaber, circiter 1.1 cm. longus, stamina paullulo superans. *Fructus* lineari-oblongus, apice truncatus, basi rotundatus vel truncatus, valde applanatus, marginibus crassis

elevatis, 3.7–13.7 cm. longus, 1.4–2 cm. latus, marginibus ad 5 mm. altis, dense fulvo- vel ferrugineo-pilosus.

STATE OF MEXICO. District of Temascaltepec : Nanchititla, in barranca, fl. April 1935, *Hinton* 7617 (typus), fl. March 1935, *Hinton* 7667, fr. June 1934, *Hinton* 6171, fr. July 1935, *Hinton* 8103, fr. August 1935, *Hinton* 8232 ; Temascaltepec, 1750 m., by the river, fr. June 1933, *Hinton* 4182, fl. March 1936, *Hinton* 8978 ; Rincón, fl. March 1932, *Hinton* 456. Described as a tree 10–12 m. high.

Vernacular name : *Jacaniquil*, but this name is applied to other species of *Inga* in the same district.

RUBIACEAE (A. A. Bullock).

Bouvardia multiflora (Cav.) Schultes in Roem. et Schultes, Syst. Veg. Mant. 3, 118 (1827) ; Standl. in N. Amer. Fl. 32, 107 (1921), et in Contrib. U.S. Nat. Herb. 23, 1363 (1926), partim, non Standl. in Publ. Field Mus. Chicago, Bot. Ser. 11, 187 (1936). *Aeginetia multiflora* Cav. in Anal. Cienc. Nat. 3, 131 (1801). *Bouvardia versicolor* Ker in Bot. Reg. 3, t. 245 (1817) ; Standl. in N. Amer. Fl. 32, 105 (1921), et in Contrib. U.S. Nat. Herb. 23, 1363 (1926). *B. Cavanillesii* DC. in DC. Prodr. 4, 366 (1830) ; Benth. Pl. Hartw. 63 (1839). *B. bicolor* Kunze in Linnaea, 20, 24 (1847). *B. macrantha* Standl. in N. Amer. Fl. 32, 107 (1921) et in Contrib. U.S. Nat. Herb. 23, 1363 (1926).

STATE OF JALISCO. Rocky bluffs of barrancas, San Marcos, June 1893, *Pringle* 4387 ; Tuquila (Tequila ?), 1839, *Hartweg* 471.

STATE OF OAXACA. *Ghiesbreght* 3.

STATE OF HIDALGO. Zimapan, *Coulter* 219.

STATE OF MICHOACAN. Hills bordering Lake Cuitzco, Aug. 1892, *Pringle* 4138.

STATE NOT DETERMINED. Chinantla, May 1841, *Liebmann* 32 ; Alpatlahua, July and Sept. 1841, *Liebmann* 73, 74 ; Consoquitla, Nov. 1841, *Liebmann* 75 ; Cumbre de Estepa, June 1842, *Liebmann* 33.

The above concept of *B. multiflora* is somewhat different from Standley's, published in the North American Flora and repeated in his " Trees and Shrubs of Mexico," and is based upon a careful study of the original descriptions, in conjunction with the specimens in the Kew herbarium, many of which have been determined by Standley himself. The flower colour, and length of corolla tube, used in his keys to distinguish *B. versicolor* and *B. macrantha*, have been found to be valueless. There are two sheets of the Pringle specimen (No. 4138) cited above at Kew, one of which has been determined by Standley as *B. macrantha*, the other as *B. multiflora*. If not from the same plant, the two specimens are certainly conspecific.

The reduction of *B. versicolor* and *B. bicolor*, both of which were founded on cultivated plants, seems to be the only possible course to adopt, in view of the general agreement between the original descriptions, and also of the fact that although *B. multiflora* is a

fairly common shrub, neither *B. versicolor* nor *B. bicolor* has ever been truly identified with wild material. Standley gives "Guana-juato and Michoacan to Oaxaca" as the distribution of *B. versicolor* (to which he reduced *B. bicolor*), but this is also part of the range of *B. multiflora*. Of the specimens at Kew, as A. Gray (in Proc. Amer. Acad. 22, 416: 1887) remarked, "The only specimen in the Kew Herbarium which answers to *B. versicolor* . . . is one cultivated in the Montpellier garden in 1831."

Bouvardia triflora H. B. K. Nov. Gen. et Sp. 3, 386 (1820). *Anotis longiflora* Benth. Pl. Hartw. 23 (1839). *Houstonia triflora* (H. B. K.) A. Gray in Proc. Amer. Acad. 4, 314 (1860). *Bouvardia versicolor* var. *graciliflora* A. Gray, l.c. 416. *B. multiflora* Standl. in N. Amer. Fl. 32, 107 (1921), et in Contrib. U.S. Nat. Herb. 23, 1363 (1926) pro min. part.

STATE OF DURANGO. At or near Durango, April-Nov. 1896, Palmer 304.

STATE OF ZACATECAS. Zacatecas, Hartweg s.n. (in herb. Hook.).

STATE OF AGUASCALIENTES. Aguascalientes, 1839, Hartweg 206 (in herb. Benth.).

STATE OF JALISCO. Rio Blanco, June-Oct. 1886, Palmer 154. Chapala, Oct.-Nov. 1886, Palmer 708. Shaded ledges, Tequila, July 1893, Pringle 4437. Barranca of Guadalajara, 1350 m., July 1902, Pringle 9820.

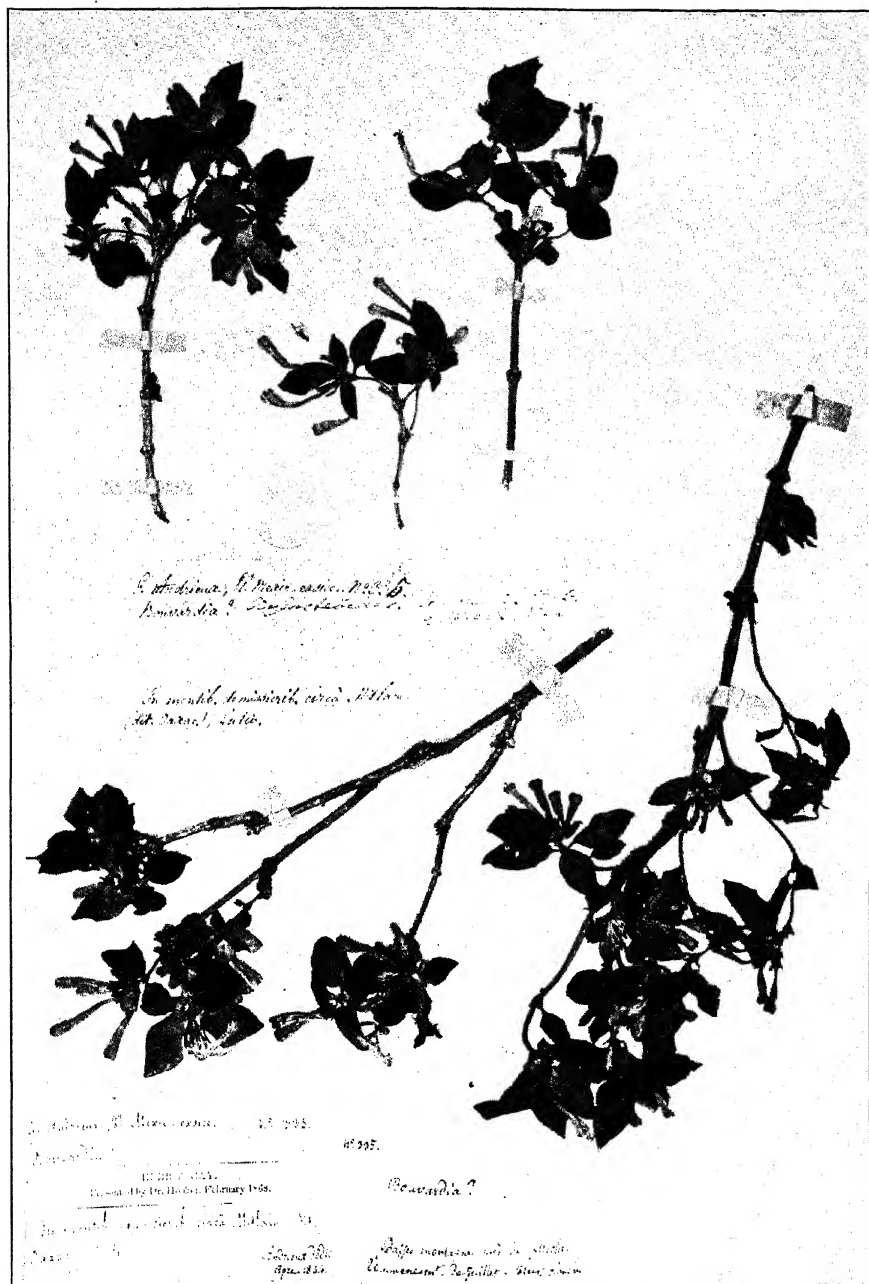
STATE OF OAXACA. Mistera alta, 2100 m., Aug., 1840, Galeotti 1224. Near Oaxaca, June, Andrieux 333.

STATE OF MICHOACAN. Hills bordering Lake Cuitzco, Aug. 1892, Pringle 4137. Campo Morado, June 1899, Langlassé 1056 (Guerrero?)

Bouvardia gracilis A. Gray, which Standley wrongly reduced to *B. multiflora*, is evidently very near to *B. triflora*. It is recorded only from Chihuahua, and the single specimen at Kew, bearing only one or two capsules, is insufficient for a decision as to its status to be made. It is rather different in facies from *B. triflora*.

B. triflora differs most markedly from *B. multiflora* in its very slender, and usually shorter, corolla. Herbarium specimens can be readily distinguished by this means, and although other technical distinguishing characters are difficult to find, the two plants present different facies, and the writer prefers to maintain them as distinct species. Careful consideration of the descriptions in the North American Flora leads to the conclusion that this plant is, in the main, Standley's *B. multiflora*, whilst specimens here referred to *B. multiflora* (Cav.) Schultes constitute his *B. macrantha*; no definite conclusion can be reached, however, as herbarium specimens unfortunately are not cited in the North American Flora.

Bouvardia xylostoides Hook. et Arn. Bot. Beechey Voy. 428 (1840); Standl. in N. Amer. Fl. 32, 111 (1921), et in Contrib. U.S. Nat. Herb. 23, 1365 (1926), sub spp. dub. *B. villosa* Standl. in N.



Photograph of the type specimen of *Bouvardia xylosteoides* Hook. et Arn., with the Herb. J. Gay specimen attached, to illustrate the label confusion described in the text (p. 307).

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Amer. Fl. 32, 107 (1921), et in Contrib. U.S. Nat. Herb. 23, 1363 (1926), et in Publ. Field Mus. Chicago, Bot. Ser. 11, 187 (1936). [Pl. X].

STATE OF OAXACA. Lower mountains near Mitla, July, *Andrieux* 335 (type of *B. xylosteoides*, in Kew Herb., cited in error by Hooker and Arnott as No. 333); Alturas de Matatlán, 1800 m., June 1906 *Conzatti* 1486 (type of *B. villosa*, in U.S. Nat. Herb., photograph in Kew herb.).

The label on the type specimen in Hooker's herbarium was twice altered by Andrieux before Hooker received it. It was first numbered "333" then changed to "335" and finally the "5" was partially obliterated and "3" written above it. That 335 is the correct number is shown by the similar specimen from Herb. J. Gay, mounted subsequently on the same sheet as Hooker's specimen, and clearly (twice) numbered "335." Andrieux' number 333 is also represented at Kew, and it was evidently part of this gathering which Standley placed under *B. multiflora* when he reduced *B. xylosteoides* to that species. In the writer's opinion, however, the Kew example of No. 333 should be referred to *B. triflora*, specimens of which are enumerated above.

The erroneous numbering of Andrieux' No. 335 accounts for Standley's reduction of *B. xylosteoides* and maintenance of his own *B. villosa*, and serves to illustrate the danger of accepting a "type number" as the equivalent of an actual type, without reference to the original description.

Bouvardia Hintoni Bullock, sp. nov.; affinis *B. capitatae* Bullock,* sed foliis multo longius petiolatis basi valde acutis, subtus levissime pubescentibus marginibus parcissime ciliatis, calycis lobis minoribus glabris, corollae tubo brevior extra minutissime papilloso-puberulo differt.

Frutex ramosus, 2 m. altus, fere glaber; rami graciles, teretes, cortice laevi; ramuli hornotini glabri, foliosi, basi cataphyllis instructi, apice floriferi; internodia superiora usque ad 6 cm. longa. *Folia* opposita, ovata vel elliptica, usque ad 9 cm. longa et 4 cm. lata, apice acuta vel saepius acute acuminata, basi acuta vel cuneata, saepe plus minusve inaequilateralia, supra fere glabra, subtus in costa et nervis lateralibus prominulis utrinsecus 5-6 valde adscendentibus levissime pubescentia, marginibus leviter sed manifeste ciliata; petioli usque ad 1 cm. longi, supra canaliculati, marginibus ciliati; stipulae subulatae, usque ad 5 mm. longae, cum petiolo vaginato-connatae. *Flores*† apice ramulorum in thyrsos contractos usque ad 12-floros subcapitato-congesti; rami inflorescentiarum breves, raro usque ad 2.5 mm. longi; pedicelli brevissimi; bractae oppositae, vaginato-connatae, exteriores subfoliaceae, interiores valde redactae. *Calyx* urceolatus; tubus (receptaculo incluso) 2 mm. longus, glaber; limbus 4-dentatus, dentibus triangularibus

* Bullock in Hook. Ic. Pl. t. 3296 (1935).

† Flores longistyli tantum visi.

acutis ciliatis vix 1 mm. usque ad 1.5 mm. longis patentibus. *Corolla* anguste tubulosa, extra papilloso-puberula; tubus usque ad 2 cm. longus, intus basin versus villosus; lobi 4, late patentibus, oblongo-elliptici, 4 mm. longi, 2.5 mm. lati, apice subacuti. *Stamina* infra faucem inserta, filamentis filiformibus 1.5 mm. longis, antheris inclusis lineari-oblongis 1.5 mm. longis basin versus dorsifixis basi bifidis. *Stylus* filiformis 2.5 cm. longus; rami stigmatici 2, lineares, 1 mm. longi, valde papilloso, longe exserti. *Ovarium* turbinatum, 1 mm. longum, nigrum, biloculare; ovula in singulis loculis numerosa. *Capsula* non visa.

STATE OF MEXICO. District of Temascaltepec, Nanchititla, in a barranca, July, 1935, *Hinton* 8107.

***Bouvardia cordifolia* DC.** in DC. Prodr. 4, 366 (1830); Alph. DC. Calq. Dess. Fl. Mex. t. 487 (1875); Standl. in N. Amer. Fl. 32, 111 (1921), et in Contrib. U.S. Nat. Herb. 23, 1365 (1926), sub. spp. dub.; Bullock in Hook. Ic. Pl. t. 3323 (1936).

STATE OF MEXICO. District of Temascaltepec: Pantoja, on a dry hill, June 1933, *Hinton* 4078, "Shrub 1 m. high, flowers red"; Nanchititla, in oak woods, June 1935, *Hinton* 7893, "Flowers orange"; Temascaltepec, in oak woods, July 1935, *Hinton* 7950, "Shrub 1 m. high, flowers orange."

STATE OF MICHOACAN. Near Morelia: Santa Maria, 1950 m., June 1909, *Arsène* 2753; *syn. not.*, 1910, *Arsène* 6627; Punguato, 2100 m., July 1909, *Arsène* 3046 (in Herb. Mus. Brit.).

WITHOUT LOCALITY: *Sessé and Mociño* (syntype in Brit. Mus.).

The agreement between the specimens cited and the original description and plate leaves no room for doubt that the above identification is correct. The syntype specimen at the British Museum is labelled "Herb. Pavon.", as are a large number of *Sessé and Mociño's* plants. This is a further illustration of the great value of Mr. Hinton's intensive collection in this *Sessé and Mociño* area. The *Arsène* specimens cited have been named "*Bouvardia multiflora*, var." by Standley.

***Bouvardia Houtteana* Schlecht.** in Fl. des Serres, Sér. 1, 10, 149, t. 1024 (1854-5).

I have been unable to identify this plant with any specimens in the Kew Herbarium; the original description and plate are good, and are based on cultivated plants grown by Van Houtte from seed collected in "Central America." The most important specific characters are "corollae coccineae extus minutissime puberulae . . . basi intus villosa," and it is evidently near *B. cordifolia* DC. as delimited above. It differs, however, in its laxer, multiflorous inflorescence, widely spreading corolla-lobes, "glabrous" branchlets and leaves ("foliis . . . glabris . . . supra saturate viridibus asperiusculis subtus pallidis"), the latter being ovate-lanceolate and acute at the base.

Deppea Hintoni *Bullock*, sp. nov.; *D. erythrorhizae* Cham. et Schlecht. affinis sed foliis tenuioribus longius petiolatis saepe in quoque pari inaequalibus, calycis lobis majoribus acute triangularibus, corollae lobis majoribus pro rata latioribus apice rotundatis, filamentis staminum longioribus satis differt; a *D. pubescente* Hemsl. foliis tenuioribus minus pubescentibus longius petiolatis, floribus minoribus recedit.

Frutex ramosus, circiter 1 m. altus, parce pubescens; rami ramulique graciles, ligno rubro-tincto, hornotini pilis crispatis rubris parce induti, annotini glabrati, cortice pallide brunneo laevi, internodiis 1-3 cm. longis. *Folia* tenuia plerumque opposita, rarius ternata, in quoque pari saepe inaequalia, ovato-elliptica, apice acuta, basi plerumque acutissima vel cuneata, rarius abrupte acuta, saepe inaequilateralia; lamina usque ad 7 cm. longa et 3.5 cm. lata, sed saepe minor, supra fere glabra, subtus costa et nervis lateralibus (utrinsecus 3-5) parce crispato-pubescens; petioli graciles, usque ad 3 cm. longi, crispato-pubescentes. *Cymae* laterales et terminales, circiter 12-20-florae, laxae, pedunculis gracilibus 1.5-2.5 cm. longis fere glabris, pedicellis gracilibus ebracteolatis 2-7 mm. longis, bracteis minutis deciduis. *Calyx* (ovario incluso) campanulatus vel turbinatus, 2 mm. longus, 1 mm. diametro, extra levissime pilosulus vel fere glaber, limbo 4-dentato, dentibus triangularibus acutis usque ad 3.75 mm. longis saepe plus minusve inaequalibus. *Corolla* ut videtur aurantiaco-rubra, rotata, tubo vix 1 mm. longo, circiter 7 mm. diametro, extra intusque glabra; lobi 4, late elliptici, vix 3 mm. longi, 2 mm. lati, apice late rotundati, nervis parallelis 5 instructi. *Stamina* 4, corollae basi inserta, filamentis linearibus rubris 1.5 mm. longis, antheris oblongo-ellipticis apice obtusis basi bifidis basin versus dorsifixis 2 mm. longis 0.75 mm. latis. *Discus* annularis, carnosus. *Stylus* linearis, 3.5 mm. longus, apice stigmatosus, clavellato-ampliat. *Capsula* non visa.

STATE OF MEXICO. District of Temascaltepec: Tejupilco, in a barranca, 1340 m., 27 Sept., 1933, *Hinton* 4824.

Closely allied to *D. erythrorhiza* Cham. et Schlecht., the type of the generic name, *D. Hintoni* differs in its somewhat larger flowers, with relatively broader and more rounded lobes, and in the very thin leaves, with longer and more slender petioles and relatively broader lamina. The peduncles and pedicels also are usually shorter in *D. Hintoni* and not quite so slender, and the plant presents a very different facies.

D. Hintoni is closely related also to *D. pubescens*, from which it differs in its thin, less pubescent leaves, longer and more slender petioles, and smaller flowers.

The wood of *D. Hintoni* is reddish in colour, and the same colour is present in the dried flowers; if this colouring matter, as seems probable, is present in life, *D. Hintoni* is thereby distinguishable from all other known species, where the flower-colour is white to yellow, with the possible exception of *D. pubescens* in which the

flower-colour is unknown, though the red colouring matter is present in the wood.

I have not seen the type of *D. erythrorhiza*, collected by Schiede and Deppe in Vera Cruz, but have accepted as conspecific the Schiede specimen from the Barranca de Tiosela, cited by Schlechtendal in *Linnaea*, 9, 599 (1835).

XXVII—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: XVIII.* E. M. MARSDEN-JONES AND W. B. TURRILL.

SELFINGS OF TWO PLANTS OF *S. VULGARIS* FROM BULGARIA AND THE RESULTS OF CROSSING ONE WITH ENGLISH *S. MARITIMA*.

Seeds of many plants of *Silene vulgaris* collected in the Balkan Peninsula have been grown at Potterne and Kew. The two *S. vulgaris* plants dealt with here were selected from stocks raised from seed collected in the western and southern mountains of Bulgaria. They were tall broad-leaved plants. The cross with British *S. maritima* was made partly with the object of discovering if sterility resulted from a cross geographically and morphologically wider than any we had then made between these two species.

The stock plants B.35 and B.36 and the families of wild origin from which they were chosen suffered very badly from *Marssonina* both at Kew and Potterne. The selfed offspring of B.35 and B.36 were also highly susceptible and many plants were completely killed in the course of their second year. We have found in general that most of the inland *S. vulgaris* from south-eastern Europe is, when grown in this country, very susceptible to this fungus disease. Hybrids between British *S. maritima* and Balkan *S. vulgaris* are decidedly resistant.

The following selfings and crosses were made.

N.23 = B.35 selfed.

N.56 = B.36 selfed

N.99 = N.56 plant 27 selfed

N.25 = A.6 × B.36

N.89 = N.25 plant 1 selfed

N.90 = N.25 plant 3 selfed

N.98 = N.25 plant 2 selfed

B.35. Seed collected on the Karlik Dag, Greek-Bulgarian frontier, southern Rodopes, 19.7.26, on dry open slopes in *Abies* zone.

Habit: stems erect, up to 6.0 dm. high, with merest trace of anthocyanin in vegetative parts, glabrous.

Leaves: lanceolate to oblong, 6 cm. long, 2.2 cm broad, glabrous, yellow-green in colour.

Inflorescence: with up to 100 flowers, more or less drooping, zygomorphic; bracts all at first green-herbaceous, many becoming scarious later, without cilia, rather elongated; plant hermaphrodite.

*Continued from K.B. 1937, 53.



Dried specimen of *S. vulgaris*, B. 35, from seed collected on the Graeco-Bulgarian frontier.

²
Calyx : inflated, with merest trace of anthocyanin.

Corolla : with petals divided $\frac{3}{4}$ length of lamina, petals and segments not contiguous or overlapping, petals 1.4 cm. long, 0.4 cm. broad, with well developed bosses, no blotch ; corolla 1.6 cm. diam.

Filaments : purple ; anthers purple.

Immature seeds : white. *Stigmata* purple.

Ripe capsules : of *vulgaris* type with erect teeth, I-II in shape, 6 mm. long, 6 mm. diam. ; teeth 1.5 mm. long ; mouth 2 mm. diam.

Carpophores : 3 mm. long, 2 mm. diam.

Mature seeds : tubercled.

N.23. = B.35 selfed. 21 plants in the family.

Vegetative characters and calyces uniformly as in the parent, stems up to 6.0 dm. high.

Inflorescence : with 16 to 36 flowers.

Petals : and segments not contiguous or overlapping ; petals divided $\frac{3}{4}$ length of lamina ; 20 with bosses : 1 small scale ; no blotch.

Androecium : 6 with hermaphrodite flowers only : 1 with hermaphrodite and female flowers : 14 with female flowers only ; filaments 5 purple : 1 white ; anthers 6 purple.

Gynoecium : stigmata 8 purple : 13 white ; immature seeds all white.

Mature capsules : all scorable (6) were of typical *vulgaris* shape, with erect teeth.

Mature seeds : all scorable (4) were tubercled.

All the plants in this family suffered very badly from *Marssonina*.

B.36. Seed collected above the Rila Monastery, Rodopes, Bulgaria, 1.8.26, dry open slope in *Fagus silvatica* zone.

Habit : stems erect or slightly ascending up to 7.2 dm. high, with a medium amount of anthocyanin, medium short pubescence ; plant hermaphrodite.

Leaves : lanceolate to oblong, 7 cm. long, 2.5 cm. broad, shortly pubescent on both surfaces.

Inflorescence : with up to 50 flowers, more or less drooping, zygomorphic, bracts all at first green-herbaceous, many becoming scarious later, without cilia, rather elongated.

Calyx : inflated, with medium anthocyanin.

Corolla : 1.5 cm. diam. ; with petals divided $\frac{3}{4}$ length of lamina, petals and segments not contiguous or overlapping, petals 1.6 cm. long, 6.5 mm. broad, with well developed bosses, white above, yellowish green below, with anthocyanin blotch.

Filaments : purple ; anthers purple.

Immature seeds : white. *Stigmata* purple.

Ripe capsules : of the *vulgaris* type with erect teeth, I-II in shape, 6 mm. long, 6 mm. diam. ; teeth 1.5 mm. long ; mouth 2 mm. diam.

Carpophores : 3 mm. long, 2 mm. diam.

Mature seeds : armadillo, but the "plates" not well defined.

N.56 = B.36 selfed. 49 plants in the family.

Habit and vegetative parts : as parent ; stems up to 6.2 dm. high.

Indumentum : 36 medium : 6 few : 7 glabrous.

Inflorescence : with up to 50 flowers, zygomorphic ; bracts as in parent.

Calyx : inflated ; 1 with much anthocyanin : 44 with medium : 4 with little.

Corolla : petals white above yellowish green below, all petals divided $\frac{3}{4}$ length of lamina, petals and segments not contiguous or overlapping, all with bosses, 47 with blotch : 2 with no blotch, colour as parent.

Androecium : 36 with hermaphrodite flowers only : 6 with hermaphrodite and female flowers : 7 with female flowers only : filaments all purple ; anthers all purple.

Gynoecium : stigmata all purple, except one white ; immature seeds all white.

Ripe capsules : all scorable were of *vulgaris* type, with erect teeth (10 unscorable).

Mature seeds : all scorable were armadillo (11 unscorable).

N.99 = N.56 plant 27 selfed. 78 plants in the family.

N.56 plant 27 was glabrous and had hermaphrodite and female flowers, a petal blotch, and purple stigmata.

The plants were all uniform for the following characters: habit and foliage as parent ; anthocyanin in vegetative parts medium ; glabrous ; flowers all zygomorphic ; calyx inflated ; petals white above yellowish-green below, $\frac{3}{4}$ lobing, with bosses, petals and segments not contiguous or overlapping ; filaments and anthers purple ; immature seeds white. Stems up to 6.3 dm. high. Inflorescence with up to 120 flowers.

Anthocyanin in calyx : 59 medium : 17 little.

Petals : 13 multilobed : 52 bilobed ; 45 anthocyanin blotch : 20 no anthocyanin blotch.

Sex : 4 with hermaphrodite flowers only : 7 with hermaphrodite and female flowers : 54 with female flowers only.

Stigmata 54 purple : 10 white ; immature seeds all white.

Ripe capsules : all scorable were of *vulgaris* type, with erect teeth (22 unscorable).

Mature seeds : all scorable were armadillo (30 unscorable).

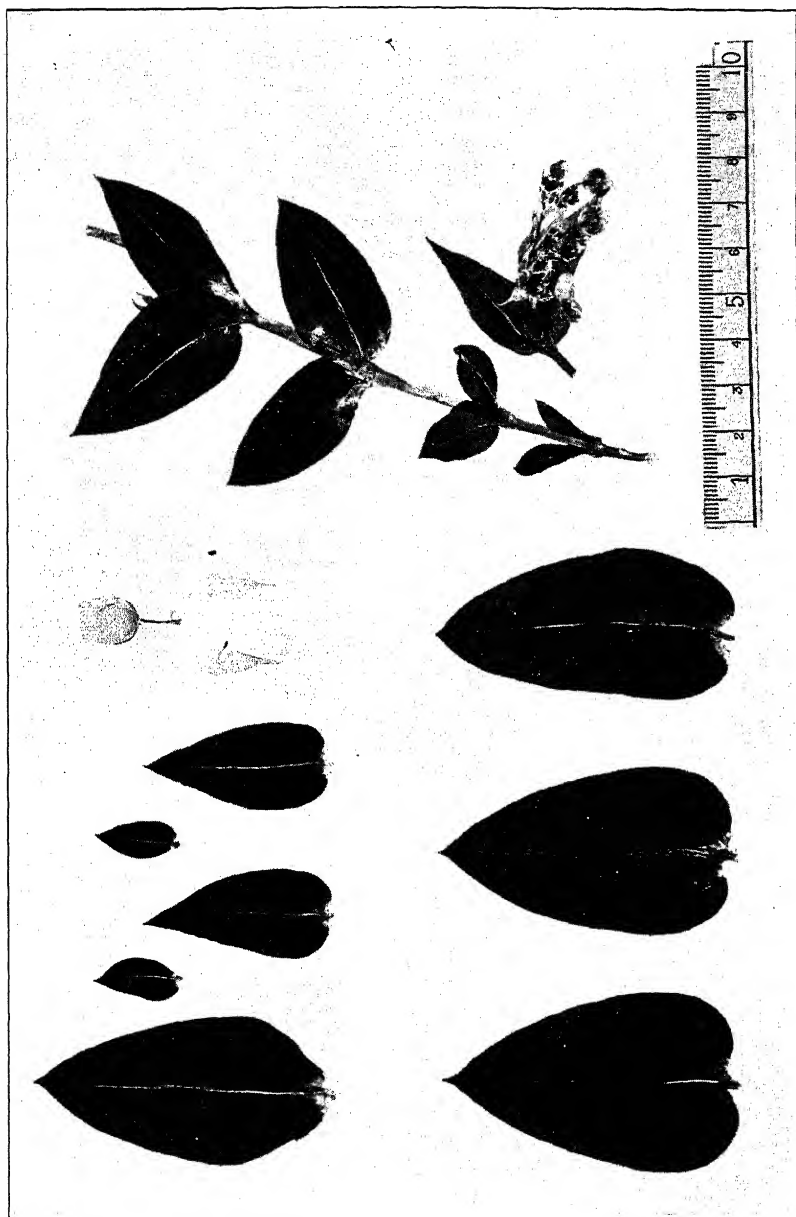
Many of the plants in this family produced poor fruits and little or no seed, mainly owing to bad *Marssonina* attack.

N.25. = A.6 \times B.36. 6 plants in the family.

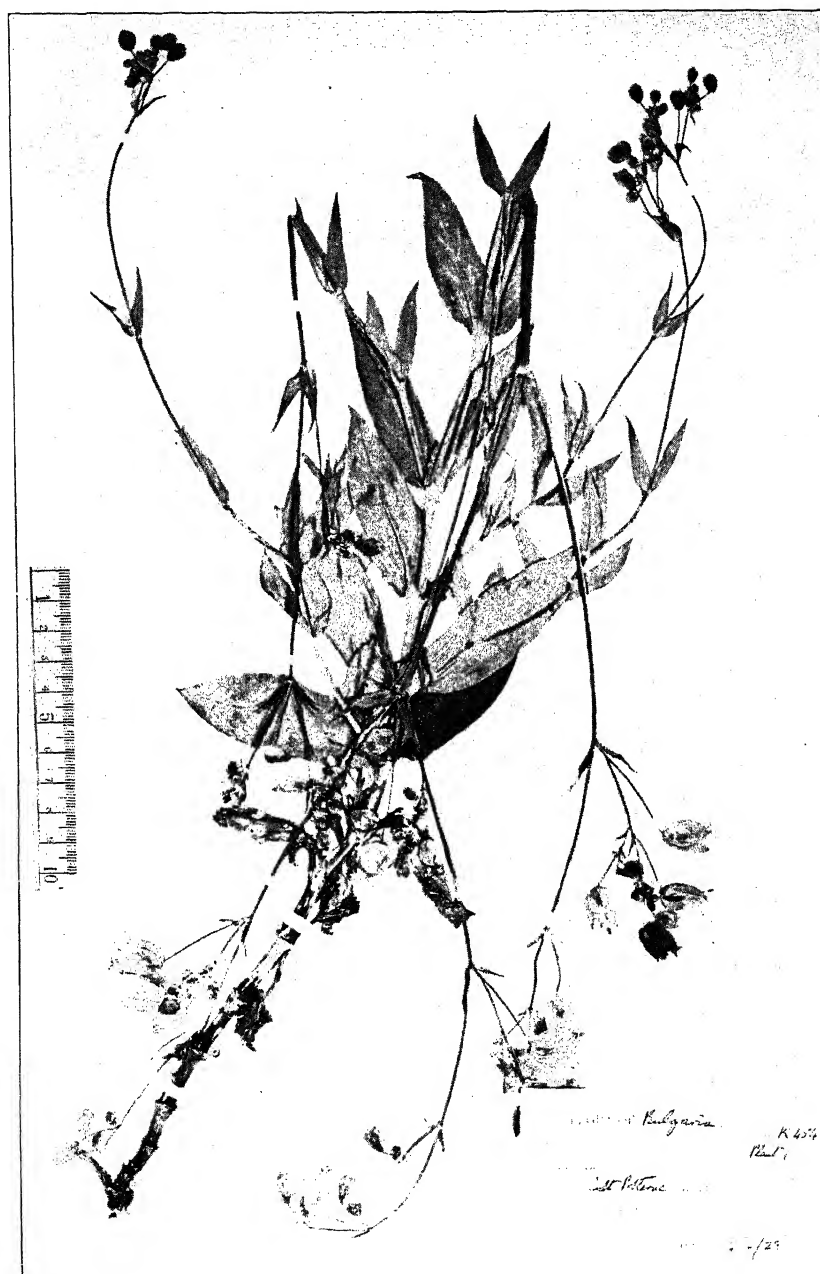
These were uniform for the following characters: habit spreading ; medium anthocyanin in vegetative parts ; intermediate for dying down or overwintering of barren shoots ; leaves narrow oblanceolate to narrowly elliptic, average of well formed leaves 4.6 cm. long, 0.8 cm. broad ; calyx with medium anthocyanin ; flowers zygomorphic ; petals and segments not contiguous or overlapping, blotch

PLATE XII

[*Kew Bulletin*, 1937



Material showing leaf and floral characters of the plant in Pl. XI.



Dried specimen of *S. vulgaris*, B. 36, from seed collected above the Rila Monastery, Bulgaria.

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present, bilobed, $\frac{3}{4}$ lobing, small scales; filaments, anthers, stigmata and immature seeds coloured. The three plants used to produce the F_2 families had armadillo seeds and *maritima* shaped capsules with the teeth reflexing. Plants of this family set very little seed per fruit on selfing.

Differential characters for the three plants used to produce the F_2 families are:

Plant 1. Stems prostrate, 6.2 dm. long; plant glabrous; calyx subinflated.

Plant 2. Stems ascending, 3.8 dm. long; with medium short indumentum; calyx narrow.

Plant 3. Stems ascending, 5.5 dm. long; with medium short indumentum; calyx subinflated.

N.89 = N.25 Plant 1 selfed. 50 plants in the family.

Habit: 29 spreading; 21 compact; 8 prostrate; 42 ascending; stems from 2.0 up to 7.7 dm. long; 11 much anthocyanin in vegetative parts; 37 medium; 2 little; all glabrous; 10 with overwintering shoots as in *S. maritima*; 33 intermediate; 5 with green overwintering shoots absent.

Leaves: 2 M: 2 HM: 4 MH: 17 H: 18 VH: 7 HV: 0 V

Inflorescence: with up to 53 flowers; all more or less zygomorphic.

Calyx: 21 inflated: 26 subinflated: 3 narrow; 7 with much anthocyanin: 41 medium: 2 little.

Corolla: petals white; 46 petals divided $\frac{3}{4}$ the length of the lamina: 3 divided $\frac{2}{3}$; 9 plants had "poor petals": 41 normal petals; 9 multilobed: 41 bilobed; 1 scale: 2 small scale: 46 boss; 39 with anthocyanin blotch: 10 with no blotch; 17 petals overlapping or contiguous: 32 not overlapping or contiguous; 27 segments overlapping or contiguous: 22 not overlapping or contiguous.

Androecium: 18 with hermaphrodite flowers only: 2 with hermaphrodite and female flowers: 30 with female flowers only; 20 filaments purple; 20 anthers purple.

Gynoecium: stigmata 8 white: 41 purple; immature seeds 5 white: 45 purple.

Ripe capsules: *maritima* shape 5: *vulgaris* shape 4: intermediate 18: unscorable 23; reflexing teeth 7: erect teeth 4: spreading 16: unscorable 23. Erect teeth and *vulgaris* shape were exactly correlated. One *maritima* type had spreading teeth the remainder reflexing. Three intermediate types had reflexing teeth.

Mature seeds: 14 (all scorable) were armadillo.

Many of the plants of this family produced poor fruits and very little or no seed.

N.90 = N.25 Plant 3 selfed. 51 plants in the family.

Habit: 22 spreading; 29 compact; all ascending; stems from 2.2 dm. up to 7.7 dm. long; 5 much anthocyanin in vegetative parts: 46 medium; 12 indumentum dense: 22 medium: 4 few:

13 glabrous ; overwintering shoots as in *S. maritima* 16 : intermediate 30 : green overwintering shoots absent 4.

Leaves : 0 M : 5 HM : 12 MH : 23 H : 10 VH : 1 HV : 0 V

Inflorescence : with up to 36 flowers ; all more or less zygomorphic except 1 plant actinomorphic.

Calyx : 4 inflated : 46 subinflated ; 3 with much anthocyanin : 47 medium.

Corolla : petals white ; all petals divided $\frac{3}{4}$ the length of the lamina ; 3 plants had "poor petals" : 48 with normal petals ; 1 plant had involute petal segments ; 2 multilobed ; 49 bilobed : 0 scale : 1 small scale ; 48 boss ; 45 with anthocyanin blotch : 4 with no blotch ; 12 petals overlapping or contiguous : 37 petals not overlapping or contiguous ; 16 segments overlapping or contiguous : 33 segments not overlapping or contiguous.

Androecium : 41 with hermaphrodite flowers only : 3 with hermaphrodite and female flowers : 6 with female flowers only ; 44 filaments purple ; 44 anthers purple.

Gynoecium : stigmata 8 white : 41 purple ; immature seeds 3 white : 46 purple.

Ripe capsules : *maritima* shape and reflexed teeth 4 : *vulgaris* shape and erect teeth 8 : intermediate shape and spreading teeth 34 : unscorable 5.

Mature seeds : 46 (all scorable) armadillo.

Many of the plants of this family produced very little seed.

N.98 = N.25 Plant 2 selfed. 26 plants in the family.

Habit : 16 spreading : 10 compact ; 9 prostrate : 17 ascending ; stems from 1.7 up to 6.8 dm. long ; 7 much anthocyanin in vegetative parts : 9 medium : 7 little : 3 none ; 0 indumentum dense : 12 medium : 12 few : 2 glabrous ; overwintering shoots as in *S. maritima* 8 : intermediate 12 : green overwintering shoots absent 4.

Leaves : 0 M : 6 HM : 7 MH : 8 H : 4 VH : 1 HV : 0 V

Inflorescence : with up to 63 flowers ; all more or less zygomorphic.

Calyx : 0 inflated : 18 subinflated : 8 narrow ; 3 with much anthocyanin : 14 medium : 5 little.

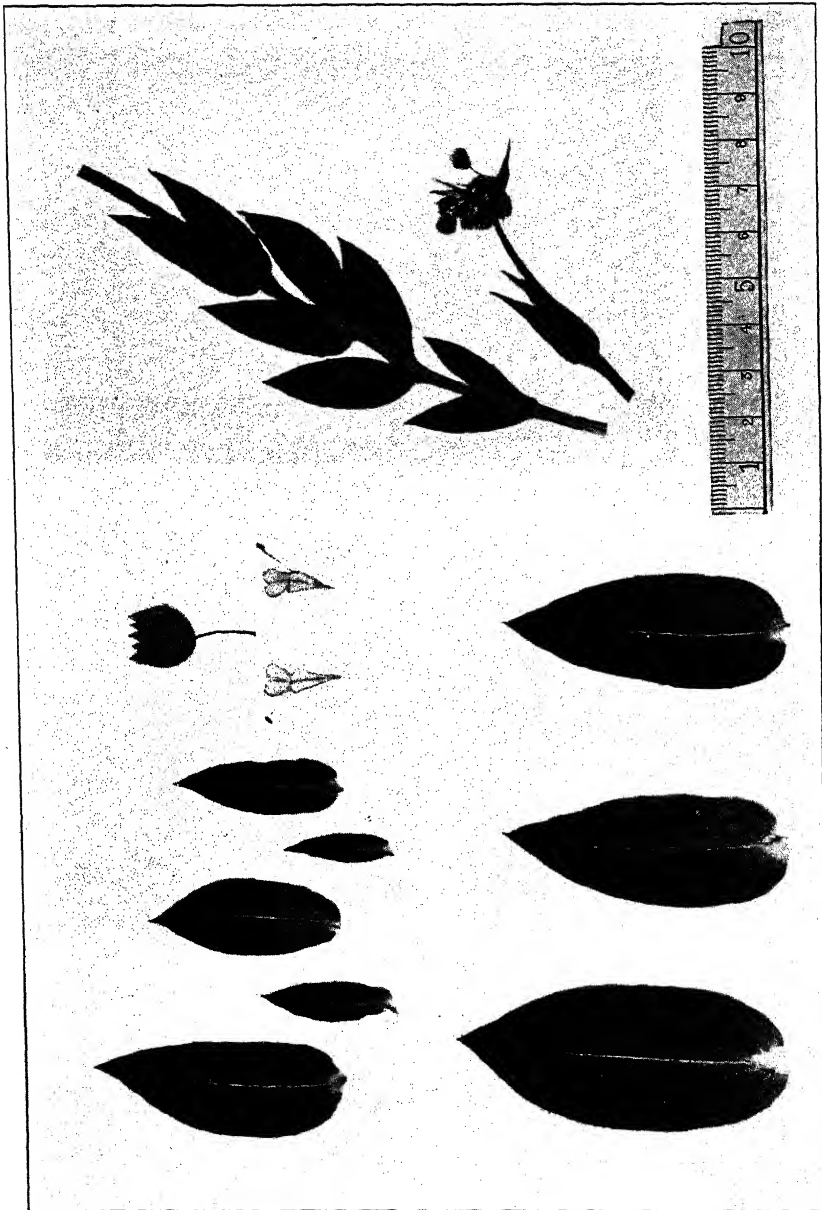
Corolla : 19 petals white : 6 white above, yellowish-green below : 1 flushed pink ; all petals divided $\frac{3}{4}$ the length of the lamina ; 6 multilobed : 19 bilobed ; 1 scale : 15 small scale : 10 boss ; 17 with anthocyanin blotch : 9 with no blotch ; 8 petals overlapping or contiguous : 17 petals not overlapping or contiguous ; 6 segments overlapping or contiguous : 19 segments not overlapping or contiguous.

Androecium : all hermaphrodite ; 25 filaments purple : 1 white ; 21 anthers purple : 5 yellow-green.

Gynoecium : stigmata 6 white : 20 purple ; immature seeds 9 white : 17 purple.

PLATE XIV

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Material showing leaf and floral characters of the plant in Pl. XIII.

Ripe capsules : *maritima* shape with reflexed teeth 12 : *vulgaris* shape with erect teeth 0 : intermediate shape with spreading teeth 11 : unscorable 3.

Mature seeds : 23 (all scorable) armadillo.

DISCUSSION.

Stock plant B.35 bred true for all specific diagnostic characters and for many of the intraspecific varietal characters. It segregated for sex, filament colour, and stigma colour. It was impossible to use this plant and its offspring for further experiments owing to their high degree of susceptibility to *Marssonina*.

Stock plant B.36 also bred true for all specific diagnostic characters, and for the intraspecific varietal characters studied except that in the first selfing it segregated for anthocyanin in calyx, for petal blotch, indumentum, sex, and stigmata colour, and a selfed offspring segregated for anthocyanin in calyx, lobing for petals, anthocyanin blotch, sex, and stigmata colour.

B.36 was remarkable for its large broad leaves and it was crossed with a narrow leaved *S. maritima* (A.6), described in Kew Bull. 1929, 147, using this latter as the ovule parent. Three F_1 sibs were selfed and the following discussion is given of the results obtained.

Habit. Spreading dominated over compact in F_2 but the totals for the three F_2 families showed little difference ; ascending dominated over prostrate and very few prostrate plants appeared in the F_1 families. The maternal grand-parent had a rather intermediate (half-prostrate) habit.

Stem length. The totals for the F_2 families show a frequency table giving a close approximation to a normal curve with the mode in the class 41-50 cm. This and the figures generally point to a rather predominating influence of the maternal parent.

Family	11-20	21-20	31-40	41-50	51-60	61-70	71-80	Max- imum	Mini- mum	Mean	S.D. of mean
N.89	1	1	7	18	12	8	3	77	20	51	12.3
N.90	0	8	13	21	5	3	1	77	22	43	11.8
N.98	0	5	2	6	10	2	0	68	17	46	13.8
Totals	2	14	22	45	27	13	4	77	17	46	

Table of stem lengths, with a frequency table based on seven classes with 10 cm. as the class range, and maximum, minimum, and mean in cm., and standard deviation of the mean for three F_2 families from three F_1 sibs.

Leaves. The totals for the three F_2 families are : 2 M : 13 HM : 23 MH : 48 H : 32 VH : 9 HV : 0 V. There is no doubt that segregation occurs but it is not clear-cut, the limits between the groups being difficult to define. Plants of hybrid type are most numerous and in 127 F_2 plants only 2 could be assigned to the same

leaf type as the maternal grand-parent, and none to the same leaf type as the paternal grand-parent, i.e. while the extreme narrow leaf type of the Portland variety of *S. maritima* reappeared twice (in the same F_2 family, N.89), the extreme broad leaf type of the Bulgarian *S. vulgaris* did not reappear at all. At least three factors, possibly of a cumulative nature, must be involved, perhaps more.

Inflorescence. Flower counts for all plants were not made. The maximum values given are segregates of a *vulgaris* character. Only one plant (out of 127) had completely actinomorphic flowers, all the others had flowers more or less zygomorphic.

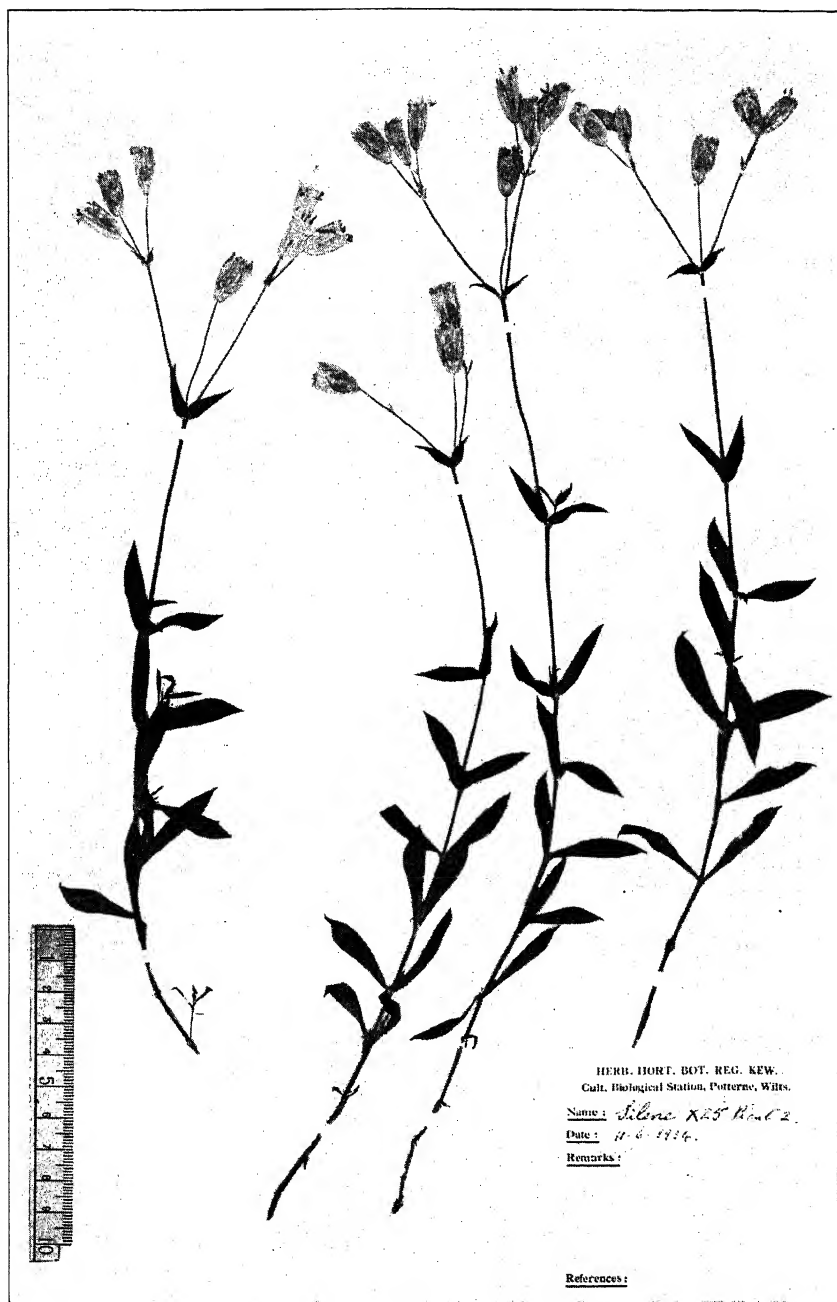
Indumentum. This was of a rather short type. The parent B.36 on selfing segregated for indumentum and a glabrous plant of the selfed family bred true to the glabrous character on selfing. The F_1 family also segregated for indumentum. The F_2 family from a glabrous F_1 was glabrous. The F_2 families from plants with medium indumentum segregated, the larger giving the four types—dense, medium, few, and glabrous.

Calyx. The F_1 family showed segregation for calyx shape, and while all three F_2 families showed a maximum of "subinflated", "inflated" types appeared only in the two F_2 families with a "subinflated" F_1 parent and the F_2 family with a "narrow" F_1 parent produced a ratio of 9 subinflated : 4 narrow.

Corolla. Three plants (in one family) had petals divided only $2/3$, and 12 plants, distributed in two families, produced "poor petals" as against 81 with normal petals in the same two families. One plant also appeared with involute petal lobes. 17 plants had some multilobed petals and 109 only bilobed petals (at the times of scoring). The F_1 was uniform for small scale (a typical interspecific F_1 condition) but only 2 full scales appeared (in two families) in F_2 and only in one family (N.98) did small scale plants exceed in numbers those with bosses. Not overlapping of petals and of segments is dominant to overlapping (or contiguity) in F_1 and segregation occurs in all F_2 families with dominance in ratios from 2 : 1 to 3 : 1, except in one family for segments where the ratio is inexplicably 11 : 13.5.

Sex. One family gave a large proportion of female plants, the other two predominantly or entirely hermaphrodites. The immediate parent of the former was probably heterozygous for sex though entirely hermaphrodite at the time of scoring.

Mature capsules. The ratios for the three F_2 families total 25 *maritima* : 63 intermediate : 8 *vulgaris*. The poor development and small size of many of the capsules, however, made scoring very difficult. The dominance of *maritima* capsules in the (very small) F_1 family was unexpected. The correlation between *maritima* shaped capsules and reflexing teeth, *vulgaris* shaped capsules and erect teeth, and intermediate capsules and spreading teeth is very high and sometimes unity. There is, however, occasionally a breakdown of the correlation in the F_2 families, and such a breakdown is occasionally found in the wild (see Kew Bull. 1931, 132-133). There appears to



Material of N. 25. Plant 2 (A. 6 × B. 36).

be here either a close linkage with a low-percentage of breaks or interference by other genes of the normal phenotypic expression which characterizes one gene.

Mature seeds. All families bred true for armadillo seeds.

Anthocyanin development.

Vegetative parts :

	much	medium	little	none
N.89	11	37	2	0
N.90	5	46	0	0
N.98	7	9	7	3

Calyx:

	much	medium	little	none
N.89	7	41	2	0
N.90	3	47	0	0
N.98	3	14	5	4

Anthocyanin blotch;

N.89	39 present	10 absent
N.90	48 „	4 „
N.98	17 „	9 „

Filaments :

All purple except in N.98 with the ratio 25 purple : 1 white

Anthers :

All purple except in N.98 with the ratio 21 purple : 5 yellow-green.

Stigmata :

N.89	41 purple	: 8 white
N.90	41 „	: 8 „
N.98	20 „	: 6 „

Immature seeds :

N.89	45 purple	: 5 white
N.90	46 „	: 3 „
N.98	19 „	: 9 „

An interesting uniformity in the above figures is the higher proportion of plants showing absence of anthocyanin in any one organ in N.98 than in the other two families. We have frequently noticed a high correlation for anthocyanin development in different organs, which however may not hold for any individual plant. There seems to be some group of general controlling factors which can, however, have their action modified by the action of other factors. In the figures for the above F_2 families no action of an inhibitor can be traced (cp. Kew Bull. 1932, 236-238), but three basic gene pairs appear to be necessary, two dominants of which must be present to give colour.

SUMMARY.

In this paper the genetics of two stocks of *Silene vulgaris* from Bulgaria are investigated by selfings and by crossings, one of them with English *S. maritima*. The two Bulgarian plants showed relatively little segregation on selfing.

On crossing *S. maritima* (narrow leaved) from Dorset with the very broad-leaved *S. vulgaris* decided (but partial) sterility was shown in F_1 and in F_2 . Considerable segregation occurred in the F_2 families. A predominating influence of the ovule parent was shown for stem length. Only two plants out of 127 had foliage of the *S. maritima* grand-parental type and none foliage of the *S. vulgaris* grand-parental type; 125 showed various intermediate shapes, the figures suggesting that three or more gene pairs were involved. Segregation also occurred for indumentum, calyx-shape, petal characters, sex, and capsule shape. The plants bred true for armadillo seeds even in the interspecific cross and its offspring. The segregation for anthocyanin development in different organs suggested the interaction of three factor pairs, two dominants of which are essential for the production of colour.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XXVIII—IMPERFECTLY KNOWN SPECIES MISPLACED IN THE FLORA OF THE MALAY PENINSULA.

G. F. SYMINGTON (Forest Research Institute, Keping).

While working in the Herbarium at Kew in 1936, I noted several old Malayan collections upon which have been based new species, and sometimes genera, that are remote from the systematic position which the plants clearly should occupy. Such mistakes are easily made in the absence of adequate material for examination or comparison, but once detected they are fairly obvious. I am recording the necessary corrections as it is desirable to take every opportunity of ridding the literature of redundant names.

Xanthophyllum hebecarpum Chodat (Polygalaceae), in Bull. Herb. Boiss. 4, 263 (1896); Ridl. Fl. Mal. Penins. 1, 149 (1922) = *Ryparosa Kunstleri* King (Flacourtiaceae), in Journ. As. Soc. Bengal, 59, pt. 2, 127 (1890) (Mat. p. 67); Ridl. l.c. 165.

Chodat's species is based on Curtis 1639, the Kew sheet of which consists of a branchlet with two leaves and two fruits. Ridley remarks: "I have great doubt that this is a *Xanthophyllum* at all."

Duvaliella problematica Heim (Dipterocarpaceae), in Bull. Soc. Linn. Paris, 1009 (1892) = *Dipterocarpus fagineus* Vesque (Dipterocarpaceae), in Compt. Rend. 78, 625 (1874) and Journ. Bot. 12, 149 (1874); Ridl. Fl. Mal. Penins. 1, 216 (1922).

The specimen upon which Heim founded the genus *Duvaliella* and the species *D. problematica* consists of sterile galled twigs

collected by Curtis (no. 439) from the hills on Penang Island. The genus has remained "entirely problematical," and, although mentioned by Gilg (in Engl. Pflanzenfam. ed. 2, **21**, 258 : 1925), seems to have been overlooked by most authors subsequent to Heim. There is no doubt that this is simply a sterile galled specimen of the tree, considered to be *Dipterocarpus fagineus*, which is very common in this locality. Van Slooten (in Bull. Jard. Bot. Buitenz. sér. 3, **8**, 318 : 1927) is loth to admit that the Penang tree is conspecific with *D. fagineus* Vesque (described from Borneo), but Brandis, Ridley, Foxworthy and others consider it to be so.

Peniculifera penangensis Ridl. (Sterculiaceae), in Journ. R. As. Soc. Str. Br. **82**, 173 (1920) and Fl. Mal. Penins. **1**, 290 (1922) = *Trigonopleura malayana* Hook. f. (Euphorbiaceae), in Hook. f. Fl. Brit. Ind. **5**, 399 (1887) and Hook. Icon. Plant. t. 1753 (1888) ; Ridl. op. cit. **3**, 263 (1924).

The type of Ridley's monotypic genus (Curtis 3743) has male flowers and is in every way similar to *Scortechini* 738 upon which Hooker's species and genus are based.

Curtisina penangensis Ridl. (Sapindaceae), in Journ. R. As. Soc. Str. Br. **82**, 180 (1920) and Fl. Mal. Penins. **1**, 490 (1922) = *Dacryodes longifolia* (King) H. J. Lam var. *β. penangensis* (Ridl.) H. J. Lam (Burseraceae), in Bull. Jard. Bot. Buitenz. sér. 3, **12**, 342 (1932).

When describing his species and monotypic genus, Ridley mentioned that the specimen (Curtis 3648) resembled *Dacryodes* but placed it doubtfully in the *Sapindaceae*. He appears to have mistaken galled ovarial rudiments in male flowers for fruits. This transfer to *Burseraceae* was made by Dr. Lam in 1932.

Napeodendron altissimum Ridl. (Sapindaceae); in Journ. R. As. Soc. Str. Br. **82**, 179 (1920) and Fl. Mal. Penins. **1**, 505 (1922) = *Walsura neurodes* Hiern (Meliaceae), in Hook. f. Fl. Brit. Ind. **1**, 564 (1875) ; Ridl. Fl. Mal. Penins. l.c. 412.

The specimen upon which Ridley's species and the genus *Napeodendron* were founded consists of immature flowers. A mature flowering specimen (C.F. 12665) from the same locality put the identity with *Walsura neurodes* beyond doubt.

Alseodaphne crassipes Hook. f. (Lauraceae), in Hook. f. Fl. Brit. Ind. **5**, 146 (1886) ; Ridl. Fl. Mal. Penins. **3**, 100 (1924) = *Helicia excelsa* (Roxb.) Bl. (Proteaceae), in Ann. Sci. Nat. sér. 2, **1**, 219 (1834) ; Ridl. l.c. 143.

Hooker described *A. crassipes* from a Malacca collection by Maingay (no. 1261) which has abnormally swollen panicle ends and pedicels. Ridley considered it "altogether doubtful, perhaps a *Beilschmiedia*."

Ostodes appendiculata Hook. f. (Euphorbiaceae), in Hook. f. Fl. Brit. Ind. **5**, 401 (1887) ; Ridl. Fl. Mal. Penins. **3**, 270 (1924) =

Lepisanthes Kunstleri King (Sapindaceae), in Journ. As. Soc. Bengal, **65**, pt. 2, 427 (1896) (Mat. p. 713); Ridl. op. cit. **1**, 493 (1922) = *Lepisanthes appendiculata* (Hook. f.) Symington, comb. nov.

Hooker's species was founded on *Kunstler* 4634, the Kew sheet of which bears only part of a large compound leaf and male flowers. Hooker noted that it might "form a distinct genus when female flowers and fruit are known." In describing *L. Kunstleri* King cites this same number (*Kunstler* 4634) and also 7359 which has fruits in addition to male flowers. He apparently was not aware that 4634 had been made the type of *O. appendiculata*.

XXIX—MISCELLANEOUS NOTES.

WILLIAM HALES.—The death of Mr. W. Hales, A.L.S., V.M.H., on May 11th removed one of the most skilful and most highly respected horticulturists of modern times. He was in his 64th year, and since October 1899 he had been Curator of the Chelsea Physic Garden, a position that brought him into close contact with many of the leading botanists and horticulturists of the day. In his early years he worked in the Botanic Gardens, Edgbaston, under that great gardener the late Mr. W. B. Latham, and it was during that time that he acquired the love of botany and the scientific side of horticulture that had such a marked bearing upon his life's work. At Edgbaston he had as colleagues Mr. S. A. Skan, who became a botanist at Kew, and the late Dr. E. H. Wilson of plant collecting fame, and all three were prompt to recognise the need for hard and continuous study if they were to rise to the top of their profession. Entering Kew as a young gardener in 1894, Hales spent five successful years there before being appointed Curator of the Chelsea Physic Garden. For some years before his appointment, the fortunes of the gardens had been at a low ebb, but their reconditioning had been decided upon and Hales was chosen to carry out the work. He was well fitted for it, for not only was he a capable plantsman, but he had botanical sympathies, which enabled him to appreciate and assist with the botanical research which was to form an important branch of the work of the rejuvenated Physic Garden. His position brought him into contact with many educational centres and throughout his service the happiest relationship existed between him and their staffs. A better man for the position he held cannot be imagined.

Hales took an active part in educational work connected with horticulture. He served on the committee that drew up the scheme for a National Diploma in Horticulture for Gardeners, and for several years he was an examiner for that Diploma. He also acted as an examiner in horticulture for other bodies. His advice was sought in drawing up the scheme for the B.Sc. in Horticulture instituted by the University of London, and for several years he was an examiner for that degree. Later, he acted in a similar capacity for the Horticultural Degree awarded by the University of Reading. Mr. Hales served for many years on the Scientific and

Floral Committees of the Royal Horticultural Society, and was one of the judges at the spring and autumn shows of the same body.

In recognition of his services to botany he was made an Associate of the Linnean Society in 1912. His services to horticulture were recognised by the Royal Horticultural Society in 1930 by the award of the Veitch Memorial Medal, in 1932 by the award of the Associate of Honour, and in 1935 by the bestowal of the Victoria Medal of Honour. In 1926 the Trustees of the Chelsea Physic Garden, as an appreciation of his work, sent him on a four months' tour of the tropics. During the tour he visited Ceylon, various parts of the Malay States, and Java. Throughout his career Hales was very helpful to young gardeners, but he deprecated too much spoon feeding. He believed in their working hard and studying hard, and he was very keen on gardeners supplementing a sound practical training with scientific knowledge. W. DALLIMORE.

The Structure and Composition of Foods.*—Those who have occasion to study the microscopical structure and chemistry of food materials of vegetable origin are familiar with the lack of comprehensive books on this subject written in English. The publication of this volume will, therefore, be very welcome to English speaking people. The name of Winton is already familiar in the authorship of "The Microscopy of Technical Products" (1907), and "The Microscopy of Vegetable Foods" (1916), but the present work is far more comprehensive than either of these. It is being published in several volumes, of which the second has already been noticed in this journal (K.B. 1936, 337).

It is always a difficulty in books of this kind for the author to decide whether it is preferable to arrange the subject matter on a botanical basis, or to treat similar categories of plant products together irrespective of their botanical origin. In this volume the authors have made a compromise. After a general introduction the book is divided into three parts. In the first of these the various starches are dealt with, followed by cereal products, and then starch-containing seeds from six different families. Part 2 is concerned with oil seeds from twenty-four families. Part 3, which is much shorter than the other two, deals with forage crops. The macroscopic appearance and microscopic structure of each product is described in turn, followed by an account of its chemistry. In addition to the botanical names of the plants, the English, French and German equivalents are given, and in some instances the Spanish and Italian as well. In this connexion readers in Great Britain will probably be surprised to find *Chenopodium album* under the name "Lamb's Quarters." A feature worthy of special attention is the 274 original figures (some by each author) illustrating the general

* By A. L. Winton and K. B. Winton. Vol. 1, Cereals, starch, oil seeds, nuts, oils, forage plants. New York, John Wiley & Sons, Inc. London, Chapman & Hall, Ltd. 1932. Pp. xiv+710. Price £2 10s.

appearance or microscopical structure of the various products. These are extremely clear and helpful, and those who have attempted to make illustrations of this kind will realise the great amount of time, skill and patience that their preparation must have entailed. The illustrations also afford an excellent example of the superiority of good drawings over photomicrographs for many purposes. It is most refreshing to read the following statement in a book coming from the U.S.A. where students are so frequently brought up to worship the microtome: "One modern invention, the Gillette razor blade, deserves special mention, as with its keen edge may be cut thoroughly satisfactory sections of practically every kind of material held in the fingers or between pieces of cork." Certain types of section-cutting can, of course, be done only with a microtome, but it is felt very strongly that these instruments should be avoided unless really necessary. The book is well bound, printed and indexed, and can be strongly recommended to all who are in any way concerned with the analysis of foods of vegetable origin.

C. R. METCALFE.

The Soil.*—"Comber" has become so generally accepted as a standard text-book that it is surprising to realise that the first edition was published as recently as 1927. The appearance of a third edition only four years after the second indicates the demand for the book. There is no other published in England to compare with it for a concise and yet reasonably advanced account of soil science.

That is not to say that the book is beyond criticism. The reviewer had the feeling when reading it of a certain lack of balance; the treatment of physics and physical chemistry seemed more detailed and clear than that of other branches, such as soil formation and soil fertility. There have been considerable developments in these subjects in the last few years which might have been more fully described in the new edition. However, this would have required an amount of revision that might appear prohibitive, and short of this the author has shown himself alive to recent developments. He has incorporated a number of new ideas and eliminated some of the old; there are complete new sections on the composition of humus, on water distribution and capillary potential (including Schofield's pF value), and on the use of randomised blocks in field experiments.

Some relatively minor points call for comment. The acidifying action of sulphate of ammonia (p. 113) is primarily to be attributed to the physiological action of the plant rather than to nitrification, since a culture solution will become more acid as a result of the plant taking up ammonium ion directly, and in the soil the sulphate ion

* "An Introduction to the Scientific Study of the Soil." By Norman M. Comber. Third edition. Edward Arnold, London, 1936. Pp. vii + 206. Price 7s. 6d.

left behind may combine with calcium from the clay complex ; the calcium sulphate is leached away and leaves a hydrogen clay. Among deficiency diseases attributed to minor elements (p. 132) might be included the " heart " diseases of beet, swedes, and even apples, for which boron has been shown to have a remarkable curative action. In discussing the layout of field experiments (p. 168), the phrase " The Chessboard Method or ' Latin Square ' " is perhaps an unhappy one, since the Chessboard arrangements of the past were usually systematic ones, and the essence of the Latin Square, as the author clearly shows, is its random arrangement. The most important attribute of modern field experiment design appears to have been overlooked, namely, that randomising the replicates makes a valid estimate of error possible. In other words, the experimenter finds out not only the results of his treatments, but how accurate or dependable those results are. He may be able to detect small differences ; he is also protected from following false clues.

H. L. RICHARDSON.

Hardy Fruit Growing.*—According to the preface, this book sets out to give commercial growers an introduction to the principles and practice involved in the many phases of hardy fruit growing, and to provide amateurs and professional gardeners with all the necessary information to grow fruit well. The names of the joint authors are a sufficient guarantee that the work is of a high standard.

The book is divided into three sections, the first dealing fully with the preliminary operations of fruit-growing, including soils, selection of sites, preparation of ground, selection of plants, planting technique, etc. The importance of allowing plenty of space between the plants is frequently stressed, yet in some instances the planting distances given are not too generous. The second section deals with upkeep, and in this is included cultivation and manuring, pruning, and the prevention and control of the various insect pests and diseases that afflict the fruit grower. Especially valuable is the chapter dealing with " Fertility and Sterility," since it brings together much useful information that in the past has not been readily accessible to the average fruit grower. This section would have been even more valuable if the process of budding and grafting had been illustrated, for however simple and concise the written word may be, these operations are not easy for the tyro to understand without the aid of diagrams. It is surprising that the authors advocate a tongue graft which, except for the expert, is by no means easy. Further, a simple splice or whip graft serves exactly the same purpose, and has the important advantage of simplicity and speed.

The third section deals with the commercial side of fruit growing. Here of special interest is the short chapter dealing with " What Markets and Public Want."

* By Sir Frederick Keeble and A. N. Rawes. Macmillan & Co. Ltd., London, 1936. Pp. 334. Illustrated. Price 16s.

The book, written in a simple, concise and understandable way, should prove valuable to all hardy-fruit growers.

J. COUTTS.

Botanical Magazine.—The second part of vol. 160 was published on May 8th and contains the following plant portraits:—*Rhododendron niphargum* Balf. f. & Ward (t.9480), a native of Yunnan; *Paphiopedilum Wardii* Summerhayes (t.9481), discovered by Capt. Kingdon Ward in Northern Burma in 1922 and rediscovered and sent home by him in 1930–31; *Penstemon isophyllus* B. L. Robinson (t.9482), from the State of Puebla, Mexico; *Allium cyaneum* Regel (t.9483), originally found by Przewalski in N.W. Kansu, China; *Gypsophila Oldhamiana* Miquel (t.9484), a decorative species widely spread in E. Asia; *Liabum ovatum* (Wedd.) Ball (t.9485), from the Andes of Bolivia and Peru; *Corydalis verticillaris* DC. (t.9486), from Persia and 'Iraq; *Homeria collina* (Thunb.) Salisb. (t.9487), a native of the S.W. Cape Province, South Africa; *Tripterygium Wilfordii* Hook. f. (t.9488), a handsome climber, native of Formosa and S. China to Yunnan; *Viscaria atropurpurea* Griseb. (t.9489), from Eastern Albania, S. Bulgaria, Serbia, etc., and *Lyonia macrocalyx* (Anth.) Airy Shaw (t.9490), a native of S.E. Tibet and N.W. Yunnan.

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BULLETIN OF MISCELLANEOUS INFORMATION

No. 6 1937

ROYAL BOTANIC GARDENS, KEW

XXX—NOTES ON COLLETIA SPECIES. J. R. SEALY.

The genus *Colletia* (*Rhamnaceae*) is confined to the temperate parts of South America, and contains about twenty very closely allied species, three of which, *C. infausta* N. E. Br. (Bot. Mag. t. 3644, as *C. horrida*), *C. cruciata* Hook. (Bot. Mag. t. 5033), and *C. armata* Miers, have been in cultivation a long time, whilst a fourth, *C. hystrix* Clos, was introduced about ten years ago. The first and third have both been grown for many years under the name *C. spinosa* (syn. *C. horrida*), whilst *C. cruciata*, though it differs from *C. spinosa* and from the plants grown under that name as much as one plant could well differ from another in this genus, was at one time said to be no more than a form of that species. This view was first put forward by Lindley (in Journ. Hort. Soc. London, 5, 29, c. fig. : 1850), who had received a branch of what proved to be *C. cruciata* from Mr. James Barnes, head gardener to Lady Rolle of Bicton, with the information that it was from a seedling that had been raised from "*C. horrida*," that is *C. spinosa* of gardens. Though Hooker cast doubt on the veracity of this statement when he figured *C. cruciata* in the Botanical Magazine, t. 5033, the view that this species was merely a form of *C. spinosa* persisted, and was considered as amply justified by Masters when he received a shoot of typical *C. cruciata* bearing a branch that was very similar to *C. spinosa*, see Gard. Chron. N. Ser. 9, 243, fig. 43 (1878). The late Dr. N. E. Brown, however, had apparently never been satisfied that the case for uniting the two species was really proved, and in an article in the Gardeners' Chronicle, Ser. 3, 60, 108, 121, 131 (1916) he effectively disposed of it, and showed that *C. cruciata* and *C. spinosa* were perfectly distinct species, and that although the former might occasionally produce branches superficially resembling those of the latter, yet this was merely an interesting case of branch dimorphism and could not be interpreted as indicating that the two species were identical.

In the second part of his article Dr. Brown dealt with the confusion that existed regarding *C. spinosa*, and with the identity of the garden plants to which that name had been applied. So far as the garden plants were concerned, Brown found that they represented two distinct species and that neither of them was the true *C. spinosa*. One of these species he identified with *C. armata* Miers ; for the other he proposed a new name, *C. infausta* N. E. Br., pointing out that it was in cultivation in the first half of the last century and was figured in the Botanical Register, t. 1776 (1836) and in the Botanical Magazine, t. 3644 (1839) under the name *C. horrida*, a name

to which it was not entitled. The typical forms of these two species can be distinguished from one another by the following characters :—

C. armata: branches and spines hairy; calyx-tube about 5 mm. long and about 2–2.5 mm. in diameter, lobes 2 mm. long; anthers borne on quite evident and easily seen filaments, clearly exserted from the calyx-tube; flowers Sept.–Nov.

C. infausta: branches and spines glabrous; calyx-tube 6–7 mm. long and about 4 mm. in diameter, lobes 3 mm. long; anthers borne on very short and not easily seen filaments, and not reaching above the top of the calyx-tube; flowers March–April.

It recently became necessary to verify the naming of a Kew plant of *C. armata* which it was proposed to figure for the Botanical Magazine, and which was known to be not quite typical, inasmuch as it lacked the pubescence characteristic of that species. Although the branches and spines seem to be quite glabrous, careful examination with a hand-lens shows that they are actually minutely pubescent here and there, but even so they are very different from the obviously hairy field-specimens of *C. armata* and other plants in cultivation under this name, which have the branches and spines densely clad with short spreading hairs. In other vegetative features the Kew plant falls within the range of variation of *C. armata* and its flowers are typical of that species; it cannot be regarded as more than a form of the species, and it is hardly worthy of a distinctive name. As, however, its subglabrous nature may lead to confusion in gardens with the normally completely glabrous *C. infausta*, it may be useful to distinguish it as forma *subglabra*.* There is a specimen in the Kew Herbarium, collected by Meyen in Chile, which agrees with *C. armata* in all respects except that it is completely glabrous. It was, no doubt, on this character that Miers referred the specimen—it is a very small piece—to his *C. pungens*, but it differs considerably from typical *C. pungens* in the size and form of its branches and spines, whilst the flowers seem to be more like those of *C. armata* than *C. pungens*; only in being glabrous does this specimen agree with *C. pungens* and differ from *C. armata*.

C. infausta, as Brown himself pointed out, seems to be most closely allied to *C. invicta* Miers, from which it differs chiefly in being quite glabrous, *C. invicta* being softly puberulous. The specimen which Brown described as *C. infausta* var. *coarctata*, however, is found to be minutely puberulous, a character that Brown, who distinguished it from typical *infausta* by the spines being less spreading, seems to have overlooked. The presence or absence of indumentum is not altogether a reliable character in this genus,† and it is possible

* *C. armata* Miers forma *subglabra* Sealy, forma nova a typo ramis spinisque interdum minute pubescentibus glabrescentibus recedit. Typus in Herb. Kew.

† In *C. ulicina* Hook., a very well-marked species, the branches and spines are usually very densely hairy, but in the Kew Herbarium there are three shoots, mounted together and all collected by Gillies, one with the branches and spines practically glabrous, another in which they seem to be quite glabrous, whilst in the third they are densely hairy.

that *C. infausta* is more nearly related to *C. invicta* than is supposed. *C. invicta*, however, appears to have shorter branchlets and spines than *C. infausta*, but since it is known to me only from Miers' description, it is not possible to say anything more definite at the moment. Of the origin of *C. infausta* nothing seems to be known beyond the fact that it was said to be a native of Chile and Mendoza (Argentina), and that Lindley, in Bot. Reg. t. 1776, states that "it is often raised from Chilian seeds under the name of *Retanilla*." Brown could find no field-specimens to match it, and none have come to hand since his time.

The Identity of C. spinosa.

In order to verify the naming of the garden plants, it was necessary to check Brown's conclusions regarding the nomenclature of the plants which had been confused under that epithet, and it soon became apparent that these conclusions were, in part, contrary to the modern rules of botanical nomenclature. Eventually it became necessary to re-investigate the history and identity of the plants concerned, and the results of this enquiry are given below.

The genus *Colletia* was named by Commerson, who apparently founded it upon a plant which he had collected, probably at Buenos Aires. The first description of the genus was published by A. L. de Jussieu in his *Genera Plantarum*, p. 380 (1789), where, however, the name is given as "*Colletia* Comm.", and where it is stated that it was "named after D. Collet, a compatriot of Commerson and a strong opponent of the Tournefort system of classification, who had worked on the flora of Bresse, the work, however, not yet published." Jussieu stated that the characters given were taken from the plant collected by Commerson in "Brazil" (that is, Buenos Aires), and also from specimens collected by Jos. de Jussieu in Peru; this is important for it so happens that the two plants are not conspecific. Jussieu only gave a description of the genus, and did not propose any species, so that there is no reason to attribute any of the subsequent confusion to him. His description of the stamens, however, reads: "Anthers 5 subsessile inserted at the top of the calyx between the lobes," and whilst in Commerson's plant from Buenos Aires the anthers *are* subsessile, in Jos. de Jussieu's Peruvian plant they are clearly exserted from the "calyx" on quite long filaments. The inference may perhaps be drawn that the description given by A. L. de Jussieu is Commerson's, and that Jussieu himself did no more than identify Jos. de Jussieu's Peruvian plant as belonging to the same genus as Commerson's plant. He may have modified the generic description a little, and it seems likely that he did so, for the shrubs are described as being "sometimes almost without leaves, sometimes leafy with opposite leaves," and we know that whilst there was a drawing of the Peruvian plant by Jos. de Jussieu showing the leaves, the extant Commerson specimen is aphyllous and, moreover, belongs to a species which is either aphyllous or has the leaves very soon caducous.

In 1791, J. F. Gmelin (in Linn. Syst. Nat. Ed. 13, 2, 408) provided the first specific epithet in the genus, proposing the name *Colletia spinosissima* and giving a reference to Jussieu, Genera Plantarum. He was obviously unaware that *Colletia*, as described in Jussieu's work, contained two species, and since Gmelin's brief diagnosis does not apply to one more than to the other, the name *Colletia spinosissima* rests on a mixture of two species. For some reason Gmelin's name was completely overlooked, or ignored, for twenty-eight years, and then it was placed as a synonym of another name proposed during the intervening period. De Candolle quoted it as a synonym in the Prodrômus in 1825 and Lindley mentioned it in 1850 (Journ. Hort. Soc. l.c.), but after that it disappeared, even from synonymy, and no more was heard of it until the present time.

Six years after Gmelin had published the name *spinosissima*, Lamarck, in the Tableau Encyclopédique et Méthodique, Bot. 2, 91 (1797),* proposed the name *C. spinosa* to cover the plants on which the genus was founded, so that this name covers exactly the same material as the earlier *spinosissima*; *C. spinosa* is therefore a superfluous name, a "nomen illegitimum" according to the Rules of Botanical Nomenclature (Art. 60), and must be rejected. Lamarck's description covers the Commerson plant from Buenos Aires and Jos. de Jussieu's plant from Peru, both of which he cites, but his figure, according to a note after the Latin explanation of the plate, p. 91, was taken from a picture by Joseph de Jussieu, and therefore represents the Peruvian plant. The plate (t. 129) bears only the generic name (with its French equivalent) and it appeared in 1797, but possibly some time before the text, for in 1798 Willdenow (in Linn. Sp. Pl. 1, 1113) proposed another name, *C. horrida*, for the only species he had in *Colletia*; under it he cited "*Colletia. Lamarck. encyclop. tab. 129.*" but he made no reference to Lamarck's text or to his specific epithet *spinosa*. Curiously enough, also, although Willdenow cited Jussieu, Gen. Plant. where Commerson's plant from "Brazil" and Jos. de Jussieu's from Peru are both mentioned, he himself gave only "Brasilia" for the distribution of his *C. horrida*. This name evidently covers the same material as the earlier *spinosissima* and hence, like *spinosa*, it must be regarded as a *nomen illegitimum*.

The next reference to these plants is by Ventenat, in his Descrip. Pl. Nouv. Jard. Cels, p. 92 (1800), who cited *C. horrida* Willd. with *C. spinosa* Lam. as a synonym, and added three more species to the genus—all of which have since been transferred to other genera. Persoon (Synop. Pl. 1, 245: 1805) merely copied from Ventenat, but Poiret (in Lamarck, Encycl. Méthod. Suppl. 2, 312: 1811) had *C. spinosa* Lam. with *C. horrida* as a synonym, and gave a description which corresponds with that given by Lamarck.

* The date on the title-page is actually 1793; for the dates of publication of this, and the volumes of the Encyclopédie méthodique, see Journal of Botany, XLIV. 318 (1906).

Roemer and Schultes (Syst. Veg. 5, 512: 1819) brought together all the foregoing literature, under the name *C. spinosa* Lam., citing as a synonym, along with *C. horrida*, the *C. spinosissima* of Gmelin. They also published two new species, *C. polyacantha* and *C. spicata*, both of which were apparently proposed by Willdenow, in MS., for plants collected in Peru by Humboldt and Bonpland. *C. spicata* belongs to another genus (*Scypharia*), but *C. polyacantha* was reduced as a synonym to "*C. horrida*" by Kunth in Humboldt, Bonpland and Kunth, Nova Genera et Species Plantarum, 7, 59 (1824), although he realised that Humboldt and Bonpland's plant did not correspond with Jussieu's specimens. From the description it is evidently a distinct species. De Candolle (Prodr. 2, 28: 1825) included it, together with *C. horrida* and *C. spinosissima*, as synonyms of *C. spinosa*, and added "Chile" to the distribution of the species—for what reason is not apparent.

Two years later Brongniart figured a *Colletia* under the name "*C. horrida* Vent."; but he says nothing about the origin of the plant, and, according to N. E. Brown (l.c.), its identity is doubtful, but it may be *C. ferox*. Then Hooker, in his Botanical Miscellany, 1, 153, 154 (1829),* identified with *C. spinosa* two of Gillies' plants, both of which were subsequently referred to other species, one (var. α of Hooker) to *C. pungens* Miers, and the other (var. β of Hooker) to *C. veprecula* Miers. A few years later a "*C. horrida*" was in cultivation in English gardens and was figured in the Bot. Reg. t. 1776 (1836) and in the Bot. Mag. t. 3644 (1839); this is the plant which N. E. Brown named *C. infausta* in 1916.

It will be realised that by 1840 the identity of *C. spinosa* had become thoroughly confused, and it must be placed to Miers' credit that when he dealt with the genus in 1860 (in Ann. & Mag. Nat. Hist. Ser. 3, 5, 201-216, reprinted in Contrib. Bot. 1, 251-266: 1861) he did much to straighten out the tangle, although unfortunately he himself introduced a certain amount of confusion. He made no mention of Gmelin's name *spinosissima* and evidently overlooked it, but he took *C. spinosa* Lam. as the oldest name for any *Colletia*. Realising that the Buenos Aires and Peruvian plants included under *C. spinosa* by Lamarck represented two different species, he chose the Commerson specimen from Buenos Aires as the type of *C. spinosa*, and this is the only specimen he cited for it—"Buenos Aires:—v.s. in herb. Jussieu, in Mus. Paris (Commerson)." Not only did he choose the Commerson specimen as the type of *C. spinosa* but he also made *C. spinosa* the type of the genus, stating "This species must be considered as the type of the genus which . . . was first proposed by Commerson for a plant of his own collection," and his choice of the Commerson specimen as the type is obviously quite reasonable. Moreover, whether he realised it or not, the Commerson plant agrees with the original generic description

* The date on the title-page is 1830, but see Marshall in Kew Bull. 1936, p. 87.

in having subsessile anthers, a character in which the Peruvian plant differs. Miers identified the Peruvian specimens collected by Jos. de Jussieu with a specimen collected by Dombey at Tarma, also in Peru, and described them as a new species, *C. aciculata*. Unfortunately, however, Miers gave a confused account of the origin of Lamarck's figure of *C. spinosa* and erroneously stated that it was drawn from the Commerson specimen, and this has tended to obscure his perfectly sound work with regard to the specimens that had been confused under the name *C. spinosa*. The extent to which he went astray (he was in his seventy-first year when his paper appeared) may be judged from the following extracts from his work and the comments I have made upon them.

(1) "Poiret (in 1811) first detailed the characters of the genus." This is manifestly erroneous; Miers may have meant that Poiret was the first to include other species in the genus, but even this would be wrong for Poiret merely followed Ventenat in this respect.

(2) "Poiret states (Encycl. Méthod. Suppl. ii. 312) that Lamarck figured his type from the plant brought from Peru by Jos. de Jussieu, and from Brazil (Buenos Aires) by Commerson; but he evidently confounded two species together."

The first part of this is quite wrong, Poiret says merely that the plant grows in Peru and Brazil whence it was brought by Jos. de Jussieu and Commerson. The only reference to the origin of Lamarck's figure is given by Lamarck himself, and he says that it was taken from a picture by Jos. de Jussieu ("Fig. ex icon. Josephi Juss."—Lamarck, p. 91).

(3) "I have seen the original specimens of these two plants, which are preserved in the Jussieuan Herbarium, and fastened on the same sheet. Commerson's specimen above described appears to be that figured by Lamarck as *Colletia spinosa*; Jussieu's plant, of which there are two small specimens, one in flower, the other in seed, corresponds with another larger specimen collected also in Peru (Tarma) by Dombey, which I have described under the name *C. aciculata*."

As pointed out already, Lamarck's figure is taken from a drawing of the Peruvian plant made by Jos. de Jussieu, and has nothing to do with Commerson's plant. Note that Lamarck's figure shows leaves, flowers, and fruit, all of which are present in the Peruvian specimens. Commerson's specimen lacks leaves (*fide* Miers) and evidently fruits also, for Miers makes no mention of them in his description of the specimen.

(4) "Lamarck's figure, though coarsely drawn, is tolerably correct; but the spines in the specimen [that is, Commerson's] are longer than are there represented, and not at all curved."

The spines are naturally incorrect from Miers' standpoint, since they were not drawn from the Commerson specimen at all. It is curious

that Miers makes no mention of the fact that the anthers in Lamarck's figure are long exserted on very evident filaments, and hence contrast markedly with the subsessile anthers that he himself describes and figures for *C. spinosa* (sens. strict.).

(5) "I have adapted from his [that is, Lamarck's] description and plate the character of the leaves which are now wanting in the two existing specimens, both collected by Commerson in 'Buenos Aires,' or at least in the Argentine Province." So Mier's own description of *C. spinosa* comes to be a mixture of the leaves of Joseph de Jussieu's Peruvian plant, with other features from Commerson's!

Reiche in his 'Flora de Chile' pp. 19, 20 (1898) included no fewer than five other species as varieties under "*C. spinosa* Lam," a procedure which is not justified and which suggests that Reiche had not seen any authentic material of the plants concerned. Apparently he was unaware that the original *C. spinosa* of Lamarck was based on a mixture of two distinct species, neither of which came from Chile, and he was evidently not very clear about the Commerson plant to which Miers had restricted the name *C. spinosa*, for all the varieties he refers to this species have exserted anthers, whereas in the Commerson plant the anthers are subsessile.

Finally, in 1916, Dr. N. E. Brown published the results of his investigations into the identity of *C. spinosa*, and these may be given briefly as follows:

First, he agreed with Miers that Lamarck had included two distinct species in the original *C. spinosa*, but he pointed out that Miers' account of the species was faulty inasmuch as the plant figured as tab. 129 of Lamarck's work was the Peruvian plant, and not the Commerson specimen from Buenos Aires as Miers had said.

Secondly, Brown argued that as the plant figured by Lamarck was the Peruvian species, and as there is nothing in the description that does not apply to it, the Peruvian plant should be accepted as the type of *C. spinosa*, and not the one from Buenos Aires.

Thirdly, he pointed out that *C. aciculata* Miers was identical with *C. spinosa* (as Brown defined that species) and hence became a synonym of it; he also showed that the Commerson specimen to which the name *C. spinosa* had been restricted by Miers, was conspecific with *C. atrox* Miers, and that the latter was the name to be used for it.

The first of these conclusions is quite correct, but the second must be rejected since it takes no account of the existence of the epithet *spinosissima* and of the fact that *C. spinosa* Lam. was a superfluous name and has no standing under the Rules. The legitimate application of the name *C. spinosa* therefore starts with Miers, and *C. spinosa* has to be retained for the specimen to which he restricted it, and consequently Brown was not at liberty to use the epithet *spinosa* for another species. (Brown, by the way, was well aware that Miers had restricted the name *C. spinosa* to Commerson's

specimen, for he says: "Miers in some unaccountable manner has gone out of his way to take as the type of *C. spinosa* the Buenos Aires plant"; as pointed out, however, Miers' choice was not so "unaccountable" as Brown supposed, but was, on the contrary, quite logical if the origin of the genus is taken into account.) The rejection of Brown's second conclusion necessitates an alteration in his third, since *C. aciculata* must stand as the name for the Peruvian plant; his statement that *C. spinosa* as defined by Miers is conspecific with *C. atrox* Miers seems, however, to be correct, and his choice of the epithet *atrox* for the combined species would stand, since the two names *C. spinosa* and *C. atrox* were published at the same time.

Now, however, it is necessary to restore the long-neglected epithet *spinosissima*, and this, of course, will involve an alteration in the naming. The position will be evident from the following synopsis of the species with their dates of publication and the specimens included in them:—

- C. spinosissima* Gmelin (1791), covers *Commerson* (Buenos Aires) and *Jos. de Jussieu* (Peru) since Gmelin cites A. L. de Jussieu, Gen. Plant. where these two specimens are mentioned. No type indicated.
- C. spinosa* Lam. (1797), cites *Commerson* and *Jos. de Juss.*; *nomen illegitimum*.
- C. horrida* Willd. (1798), includes *Commerson* and *Jos. de Juss.* since he cites A. L. de Juss. Gen. Plant.; *nomen illegitimum*.
- C. aciculata* Miers (1860), cites *Dombey* (Peru) and *Jos. de Juss.*
- C. atrox* Miers (1860), cites *Tweedie* (Buenos Aires)
- C. spinosa* [Lam. emend.] Miers (1860), includes only *Commerson* (Buenos Aires), considered as type of the genus by Miers. = *C. atrox* Miers fide N. E. Brown (1916).
- C. spinosa* [Lam. emend.] N. E. Br. (1916), cites *Dombey* and *Jos. de Juss.*; *nomen illegitimum* = *C. aciculata* Miers.

Now we know that the two specimens included in *C. spinosissima* represent different species, and the epithet *spinosissima* must be retained for one of them. From the history of the genus given in this article it is clear that the *Commerson* specimen agrees best with the original generic description, and, moreover, that there is good reason to believe that the genus was actually founded on this specimen; clearly, therefore, it will be most convenient to retain the epithet *spinosissima* for the *Commerson* specimen. *C. atrox* Miers has already been shown to be conspecific with *C. spinosa* Lam. emend. Miers, and since the latter is based on the *Commerson* specimen concerned, it follows that *C. atrox* is synonymous with *C. spinosissima*. As the latter is the earlier name it replaces the former, and the synonymy is as follows:—

Colletia Comm. ex A. L. de Juss. (1789)

type: *C. spinosissima* Gmelin (quoad specim. *Commerson*.)

- C. spinosissima** Gmelin (1791) quoad specim. Commerson.
 syn. *C. spinosa* Lam. (1797) emend. Miers (1860)
C. horrida Willd. (1798) emend. Miers (1860, pro syn.)
C. atrox Miers (1860)
 lectotype: *Commerson* (Buenos Aires)

- C. aciculata** Miers (1860)
 syn. *C. spinosa* Lam. (1797) emend. N. E. Br. (1916), non
 Miers (1860)
C. horrida Willd. (1798) pro parte (haud emend. Miers,
 1860)

XXXI—TROPICAL AFRICAN PLANTS: XVI.*

J. HUTCHINSON AND J. M. DALZIEL.

LOGANIACEAE

Strychnos Lecomtei *A. Chev. ex Hutch. et J. M. Dalz.* Fl. West Trop. Afr. 2, 22 (1931); affinis *S. spinosae* Lam., sed ramis haud aculeatis, foliis ovato-ellipticis longe acuminatis differt.

Frutex scandens; ramuli graciles, minute pubescentes. *Folia* ovato-elliptica, late acuminata et mucronata, basi rotundata, 5–8 cm. longa, 3–4 cm. lata, tenuia, glabra; petioli 3 mm. longi, parce pubescentes; stipulae subulatae. *Flores* minimi, congeste cymosi; bractaeae subulatae; pedicelli parce puberuli. *Calycis lobi* e basi ovato subulati, 1.5 mm. longi. *Corolla* alabastro late ovoidea, 3 mm. longa; lobi triangulares, intra basin dense hirsuti. *Antherae* latere hirsutae. *Ovarium* pilosum.

IVORY COAST: Bingerville and neighbourhood, *Chevalier* 15407 (type†); 15402.

Strychnos soubrensis *Hutch. et J. M. Dalz.* op. cit. 22; affinis *S. Afzelii* Gilg, sed inflorescentia sessili pauciflora, foliis oblanceolatis costa infra pubescentia differt.

Ramuli cirrhiferi, graciles, parce pubescentes, cirrhii bifurcatis. *Folia* oblanceolata, sensim acuminata, usque ad 8 cm. longa et 3 cm. lata, costa infra parce pilosa, e basi trinervia, nervis conjunctis numerosis e costa angulo latissimo abeuntibus; petioli 3 mm. longi, pilosi. *Inflorescentia* axillaris, sessilis, pauciflora; bractaeae subulatae, pilosae. *Calycis lobi* rotundati, extra parce puberuli, circiter 1.25 mm. longi. *Corolla* alabastro oblonga, obtusa, tubo 3 mm. longo inferne breviter pubescenti intra pilis reflexis dense induto; lobi oblongi, 2.5 mm. longi. *Stamina* exserta; filamenta 1.25 mm. longa; antherae mucronatae, 1.25 mm. longae. *Ovarium* pilosum; stylus inferne pubescens, staminibus aequilongus.

IVORY COAST: Sassandra Valley, near Soubré, May, *Chevalier* 17994 (type).

* Continued from K.B. 1937, 63.

† The types of *Chevalier's* species are in the Paris Herbarium.

Strychnos littoralis A. Chev. Explor. Bot. Afr. Occid. Franc. 443 (1920), nomen; ex Hutch. et J. M. Dalz. op. cit. 24; species valde distincta, floribus fasciculato-cymulosis, corollae tubis angustis, stylis gracilibus.

Arbor parva usque ad 7 m. alta, vel interdum frutex scandens; ramuli teretes, glabri, laxe foliati. *Folia* elliptica vel obovato-elliptica, basi cuneata, apice late vel interdum abrupte acuminata, 7-14 cm. longa, usque ad 8 cm. lata, glabra, basi triplinervia vel subquinquenervia, infra laxe reticulata; petioli 0.5-1 cm. longi. *Cymulae* axillares, subsessiles, densiflorae, circiter 1.5 cm. diametro; bracteae subulatae; pedicelli 2 mm. longi. *Calycis lobi* ovato-triangulares, subacuti, 1 mm. longi, margine minutissime puberuli. *Corollae tubus* 6 mm. longus, extra glaber, intra laxe pilosus; lobi 2 mm. longi, intra inferne pilosi. *Antherae* leviter exsertae, glabrae. *Ovarium* angustum, glabrum; stylus 8 mm. longus, glaber, stigmatibus discoideo. *Fructus* oblique ellipsoideus, 2 cm. longus, leviter rostratus.

IVORY COAST: Cavally Basin; sea coast between Tabou and Bériby, Aug., *Chevalier* 19953 (type). SOUTHERN NIGERIA: Lagos, Aug., *Dalziel* 1415. BRITISH CAMEROONS: Likomba Plantation, Oct., fl. and fr., *Mildbraed* 10521; 10527.

Dalziel describes this as a shrub or small erect tree or sometimes scrambling amongst forest foliage; *Mildbraed* states it to be a "kleines Baum, ca, 6 cm. diam., 7 m. hoch; Blüten gelblich weiss, duftend, häufig."

Strychnos tricalysioides Hutch. et M. B. Moss in Fl. West Trop. Afr. 2, 24 (1931); species aspectu *S. Staudtii* Gilg, sed foliis minoribus longe caudato-acuminatis, corollae lobis angustioribus differt.

Frutex scandens, caule 3 cm. diametro; ramuli canaliculati, glabri. *Folia* elliptica vel interdum leviter obovato-elliptica, basi breviter cuneata, apice longe caudato-acuminata, acumine obtuso 1 cm. longo, 6-10 cm. longa, 3-4.5 cm. lata, glabra, basi triplinervia; petioli 0.5-1 cm. longi, glabri. *Cymulae* axillares, brevissime pedunculatae, parvae, pluriflorae; bracteae late ellipticae, obtusae, 1.5 mm. longae; pedicelli 3 mm. longi. *Calycis lobi* late orbiculares, 1.25 mm. lati, glabri. *Corolla* alabastro oblonga, 5 mm. longa, lobis anguste oblongis 3.5 mm. longis intra inferne longe villosis. *Antherae* exsertae, glabrae. *Ovarium* glabrum; stylus staminibus brevior.

BRITISH CAMEROONS: Likomba Plantation, 15-35 km. north east of Victoria, liane, fls. yellowish-white, Oct., *Mildbraed* 10576.

Strychnos venulosa Hutch. et M. B. Moss, op. cit. 24; species foliis anguste ellipticis vel ovato-ellipticis longe caudato-acuminatis crebre reticulatis, inflorescentiis gracilibus, floribus minutis distincta.

Frutex scandens; ramuli teretes, glabri. *Folia* anguste elliptica vel ovato-elliptica, longe et anguste caudato-acuminata, basi

rotundata, 7-12 cm. longa, 2-4.5 cm. lata, utrinque prominenter reticulata, basi triplinervia, nervis lateralibus numerosis et multe ramosis; petioli 7-10 cm. longi, glabri. *Inflorescentiae* axillares, anguste racemoso-cymosae, foliis usque ad dimidio breviores, ubique glabrae; bracteae ovatae, acutae. *Flores* minuti, subsessiles. *Calycis lobi* ovati, subacuti. *Corolla* brevissima, 2-3 mm. longa. *Stamina* leviter exserta. *Ovarium* globosum, glabrum, stylo aequilongo. *Fructus* globosus, laevis, 1-5 cm. diametro.

SIERRA LEONE: Falaba, Apr., *Aylmer* 58 (type). LIBERIA: Peáhtah, fr. Oct., *Bequaert in Linder Coll.* 1073.

Linder 1084, also from Peáhtah and in young fruit, quoted in our Flora as this species is not the same, but is *S. Moloneyi* Baker.

Strychnos cinnabarina *Gilg ex Hutch. et J. M. Dalz.* op. cit. 24; species foliis late acuminatis, costa supra tomentella distincta.

Frutex scandens; ramuli divaricati, breviter pubescentes, vetustiores cirrhis lignosis circinnatis instructi. *Folia* anguste oblongo-lanceolata, basi cuneata, apice late et obtuse acuminata vel interdum emarginata, usque ad 7 cm. longa et 2 cm. lata, e basi distincte 5-nervia, costa supra minute tomentella infra basin versus hirsuta; petioli verruculosi et breviter pubescentes. *Cymae* brevissimae, puberulae. *Flores* non visi. *Fructus* globosus, fere 1.5 cm. diametro, siccus valde contractus.

SOUTHERN NIGERIA: Eket, *Talbot*. CAMEROONS: Bipinde, *Zenker* 3430 (type); 3808; between Jaunde and Dengdeng, 140 km. N.E. of Jaunde, Feb., *Mildbraed* 8342.

Strychnos Cooperi *Hutch. et M. B. Moss*, op. cit. 24; affinis *S. pusilliflorae* S. Moore, foliis ovatis vel ovato-ellipticis late et obtuse acuminatis differt.

Frutex scandens; ramuli puberuli. *Folia* ovata vel ovato-elliptica, basi rotundata, apice latissime acuminata, 7-9 cm. longa, 3-4.5 cm. lata, sicco intense viridia, glabra, subpinnatinervia, basin versus nervis lateralibus utrinsecus 2 arcuatis; petioli 0.8 cm. longi, basi abrupte articulati. *Cymae* axillares, pedunculatae, ubique minute puberulae; bracteae triangulari-subulatae. *Calycis lobi* ovato-triangulares, 0.5 mm. longi. *Corolla* perbrevis; tubus basi explanato-disciformis, profunde lobatus.

LIBERIA: Dukwia River, Mar., *Cooper* 300.

Strychnos Johnsonii *Hutch. et M. B. Moss* op. cit. 24; affinis *S. nigritanae* Baker, sed floribus minoribus, foliis oblongo-oblanceolatis differt.

Frutex scandens cirrhiferus, cirrhis bifurcatis; ramuli glabri, cinerei. *Folia* oblongo-oblanceolata, breviter acuminata, basi attenuata, 6-11 cm. longa, 2-3.5 cm. lata, basi triplinervia, nervis cum marginibus parallelis et 3-4 mm. distantibus, inter nervos laxè reticulatis; petioli 7 mm. longi. *Cymae* axillares, foliis dimidio breviores, parce puberulae; bracteae ovato-subulatae. *Calycis lobi*

triangulati-ovati. *Corolla* alabastro late oblonga, 3.5 mm. longa, infra medium lobata, lobis oblongo-lanceolatis intra basin versus leviter pubescentibus. *Antherae* exsertae, glabrae. *Ovarium* glabrum; stylus corollae leviter brevior. *Fructus* globoso-ellipsoideus, 1.5–2 cm. diametro.

SIERRA LEONE: near Buyabuya, Scarcies River, fr. Feb., *Scott Elliot* 4292. GOLD COAST: Akropong, shrubby climber with pale yellow flowers, *W. H. Johnson* 802 (type). TOGO: Misahöhe, Nov., *Mildbraed* 7336.

OLEACEAE

***Olea guineënsis* Hutch. et C. A. Smith** in Fl. West Trop. Afr. 2, 26 (1931). *O. Hochstetteri* A. Chev. Explor. Bot. Afr. Occid. Franç. 399 (1920), non Baker; affinis *O. Hochstetteri* Baker, sed acumine foliorum oblongo-ellipticorum longiore differt.

Arbor parva; ramuli cinerei, glabri. *Folia* oblongo-elliptica, apice triangulati-vel subcaudato-acuminata, basi cuneata, 8–12 cm. longa, 4–5 cm. lata, infra minutissime punctulata; nervi laterales utrinsecus circiter 7, patuli, gracillimi, marginem versus conjuncti; petioli 1.5 cm. longi, leviter verrucosi. *Paniculae* terminales, foliis breviores, glabrae; bractee parvae, triangulares. *Calyx* cupulatus, lobis deltoideis. *Corolla* alabastro obovoidea, 3.5 mm. longa. *Fructus* anguste ellipsoideus, apiculatus, 1.5 cm. longus.

IVORY COAST: Upper Cavally; Dyla Country, on Mt. Momy, 850–900 m., Apr., *Chevalier* 21358 (type). CAMEROONS MT.: above Musake, 1500 m., fr. Mar., *Mailland* 498.

This is the only species of *Olea* known from Upper Guinea and so far recorded from two widely separated localities, both mountains. It is closely related to *O. Hochstetteri* Baker, from Abyssinia and Kenya, with which Chevalier identified it, but which has less acuminate leaves, and the two species are obviously different.

***Schrebera Chevalieri* Hutch. et J. M. Dalz.** op. cit. 26; a *S. arborea* A. Chev., foliis oblongo-ellipticis longe acuminatis, petiolis molliter tomentellis differt.

Arbor parva; ramuli parce lenticellati. *Folia* oblongo-elliptica, satis longe acuminata, basi breviter cuneata, 10–18 cm. longa, 6–8 cm. lata, glabra, nervis lateralibus utrinsecus circiter 10; petioli molliter tomentelli, 1–1.5 cm. longi. *Flores* non visi. *Fructus* obovoideus, 5 cm. longus; semina 4 cm. longa ala inclusa.

SENEGAL: Casamance, Sinedone, fr. Jan., *Chevalier* 3532 (type).

APOCYNACEAE

***Glitandra ivorensis* A. Chev.** Explor. Bot. Afr. Occid. Franç. 401 (1920), partim; Hutch. et J. M. Dalz. op. cit. 34; affinis *C. nitidae* Stapf, sed foliis basi rotundatis, nervis lateralibus leviter prominentibus.

Frutex scandens 5–8 m. altus; ramuli atropurpurei, annotini laxe lenticellati; cirrhi elongati, bifurcati. *Folia* pauca, late oblongo-elliptica, abrupte et breviter acuminata, basi rotundata,

7-8 cm. longa, 3.5-5.5 cm. lata, sicco brunnea, leviter discoloria, nervis lateralibus utrinsecus numerosis e costa sub angulo lato abeuntibus prope marginem conjunctis utrinque prominulis; petioli 7-8 mm. longi, glabri. *Cymae* subsessiles, terminales et axillares, pauciflorae; bracteae ovatae, obtusae, 1.25 mm. longae; pedicelli 4 mm. longi. *Sepala* 5, ovata, 1 mm. longa, breviter ciliata. *Corollae tubus* 1.2 cm. longus, basin versus leviter expansus, superne parce pubescens; lobi 4 mm. longi, ciliolati. *Antherae* infra medium corollae tubi insertae. *Stylus* calyce duplo longior.

IVORY COAST: Bingerville, Abidjean, Dabou region, *Chevalier* 15183 (type); Abidjean, near the railway, *Chevalier* 15616.

Carpodinus macrophylla *A. Chev.* Explor. Bot. Afr. Occid. Franç. 411 (1920), nomen: Hutch. et J. M. Dalz. op. cit. 36; "*C. hirsuta* Hua?" Stapf in Johnston, Liberia, 620 (1906); species adhuc imperfecte cognita, affinis *C. oöcarpae* Stapf, sed foliis majoribus costa et nervis lateralibus infra pilosis differt.

Frutex scandens; rami cirrhosi, juniores dense et longe piloso-hispidi. *Folia* elliptica ad obovata, breviter triangulari-acuminata, basi cordata, 12-20 cm. longa, 6-10 cm. lata, papyracea, supra nitida, infra in costa nervisque plus minusve pilosa; nervi laterales utrinsecus circiter 8, infra valde prominentes, nervis tertiariis paucis arcuatis prominulis; petioli 0.5-1.5 cm. longi, piloso-hispidi. *Flores* et fructus non visi.

LIBERIA: Greenville, *Sim in Herb. Johnston* 35. IVORY COAST: Basin of the Sassandra at Guidéko, May, *Chevalier* 16369; 16405 (type). GOLD COAST: locality? *Dudgeon* 108a and b.

This still remains an imperfectly known species. It is easily recognised by its pilose-hispid branchlets, cordate-based leaves with pilose midrib and nerves below.

Carpodinus Baumannii *Hutch. et J. M. Dalz.* op. cit. 36; *C. Barteri* Stapf in Dyer Fl. Trop. Afr. 4, 1, 77, partim; affinis *C. oxyanthoidei* Wernham, sed foliis sensim acuminatis, corollae lobis tubo longioribus differt.

Frutex scandens; ramuli annotini cinerei, hornotini leviter adpresse pubescentes. *Folia* anguste oblongo-elliptica, sensim acuminata, basi rotundata, 7-10 cm. longa, 2-4 cm. lata, glabra, nervis lateralibus utrinsecus 4-5 arcuatis marginem versus conjunctis; petioli 1 cm. longi. *Flores* axillares et ad nodos defoliatos dispositi, pauci, sessiles; bracteae breviter hirsutae. *Sepala* triangularia, rufo-hirsuta. *Corollae tubus* 1.8 cm. longus, extra glaber, superne ampliatus et antheriferus; lobi late lineares, 2.5 cm. longi, 2 mm. lati, circiter 6-nervi. *Antherae* acutae, 2.5 mm. longae. *Stylus* basin versus parce pubescens.

Togo: Misahöhe, May, *Baumann* 304 (type).

Alstonia congensis *Engl.* var. *glabrata* *Hutch. et J. M. Dalz.* op. cit. 42; a typo inflorescentia et calyce leviter puberulo differt.

S. NIGERIA: Lagos town, Oct., *Dalziel* 1256.

Holalafia jasminiflora Hutch. et J. M. Dalz. op. cit. 43 ; *Alafia jasminiflora* A. Chev. Explor. Bot. Afr. Occid. Franç. 423 (1920), nomen ; *A. mirabilis* A. Chev. op. cit., nomen ; affinis *H. multiflorae* Stapf, sed foliis satis longe acuminatis, floribus cymosis numerosis, pedicellis puberulis differt.

Ramuli mox glabri, teretes, internodiis 4-5 cm. longis, nodis linea transversa puberula circumdatis. *Folia* oblonda, satis longe acuminata, basi rotundata ad subacuta, 7-10 cm. longa et 4 cm. lata, glabra ; nervi laterales utrinsecus circiter 6, fere indistincti, e costa angulo lato arcuati ; petioli circiter 7 mm. longi, basi fere saccati. *Cymae* terminales, circiter 8 cm. diametro, multiflorae, ubique rufo-tomentellae ; bractaeae triangulares, fere glabrae ; pedicelli 4 mm. longi. *Sepala* rotundato-elliptica, puberula, 2 mm. longa. *Corollae tubus* 1.2 cm. longus, glaber, lobis lanceolatis aequilongis crassis puberulis. *Antherae* parte exsertae, acutae, 6 mm. longae, basi sagittatae. *Ovarium* rufo-pubescentis ; stylus gracilis, 8-10 mm. longus. *Carbella* 15-17 cm. longa, indumento rufo instructa.

IVORY COAST : Bingerville, *Chevalier* 16583 bis ; Bouroukrou, Dec.-Jan., *Chevalier* 16644 ; Mbasso, Lower Comoé, in the forest, Mar., *Chevalier* 17606 (type). Morénou, near Akabilekrou, Dec., *Chevalier* 22507. GOLD COAST : near Kumasi, white scented flowers. May, *Vigne* 2011. S. NIGERIA : Central Province, *Rosevear* B.R. 10.

Baissea aframensis Hutch. et J. M. Dalz. op. cit. 46 ; affinis *B. multiflorae* A. DC., sed foliis haud acuminatis, inflorescentia brevissime pubescente differt.

Frutex scandens ; ramuli crebre foliati, molliter rufo-tomentosi. *Folia* oblonda, basi truncata, apice rotundato-triangularia, 3-5 cm. longa, 1.5-2 cm. lata, infra costa et axillis nervorum laxa tomentosa, nervis lateralibus utrinsecus 5-6 marginem versus sensim evanidis ; petioli 3 mm. longi, rufo-tomentosi. *Cymae* axillares, foliis aequilongae, graciles, ubique breviter pubescentes ; bractaeae ovato-lanceolatae, 2-3 mm. longae, puberulae ; pedicelli usque ad 8 mm. longi. *Sepala* ovato-lanceolata, subacuta, 3 mm. longa, extra pubescentia. *Corollae tubus* anguste infundibuliformis, glaber, 5 mm. longus ; lobi lineari-lanceolati, 1 cm. longi. *Antherae* 2 mm. longae, acutae.

GOLD COAST : Afram Plains, Wuruboug to Okraji, May, fls. yellow, *Kitson* 1140 (type) ; Aburi Hills, 250 m., June, fls. white, *Patterson* 287 ; Mayena, Akwapim, Mar., fls. white, in dry deciduous forest, *Irvine* 1534 ; Kumasi, 300 m., Apr., *Vigne* 1107.

Baissea concinna Stapf ex Hutch. et J. M. Dalz. op. cit. 46 ; affinis *B. Lane-Poolei* Stapf, sed pedicellis longioribus, foliis oblongo-oblancoelatis breviter acuminatis glabris differt.

Frutex scandens ; ramuli annotini cinerei, hornotini minute puberuli. *Folia* oblongo-oblancoelata, breviter et obtuse acuminata, basi breviter acuminata, 6-8 cm. longa, 2.5-3 cm. lata, glabra et

opaca, nervis lateralibus utrinsecus 5-6 arcuatis utrinque prominulis ; petioli 0.8-1 cm. longi, minute puberuli. *Cymae* axillares et terminales, foliis aequilongae vel longiores, divaricato-ramosae, ubique breviter puberulae ; bractae ovato-oblongae, vix 1 mm. longae ; pedicelli ad 6 mm. longi. *Sepala* rotundato-ovata, puberula, 1 mm. longa. *Corollae* tubus brevissimus, vix 1 mm. longus ; lobi oblongi, 3 mm. longi, extra carinati. *Antherae* 2.5 mm. longae.

LIBERIA : Grand Bassa, *Dinklage* 1630 (type).

ASCLEPIADACEAE

Tacazzea viridis A. Chev. Explor. Bot. Afr. Occid. Franç. 429 (1920) nomen ; Hutch. et J. M. Dalz. op. cit. 52 ; affinis *T. apiculatae* Oliv., sed calyce extra pubescente, foliis in costa et nervis pubescentibus differt.

Scandens ; ramuli breviter et parce pubescentes. *Folia* late ovata vel ovato-oblonga, basi aperte cordata, apice breviter acuminata, 6-9 cm. longa, 4-6 cm. lata, costa et nervis utrinque crispato-pubescentia, nervis lateralibus utrinsecus circiter 8, inter nervos graciliter reticulata ; petioli 2.5-3.5 cm. longi, pubescentes. *Cymae* axillares, pauciflorae, foliis aequilongae, ubique breviter pubescentes ; bractae oblongae, ad 5 mm. longae, pubescentes ; pedicelli graciles, 1 cm. longi. *Calycis* lobi ovati, 2.5 mm. longi, pubescentes. *Corollae* lobi late oblongi, fere 1 cm. longi. *Coronae* lobi lineares, 5 mm. longi.

IVORY COAST : Mankono district ; between Dialakoro and Kénégoué, July, *Chevalier* 21975 (type). Baule-Nord district ; between Marabadiassa and Gottoro, July, *Chevalier* 22025.

Asclepias solstitialis A. Chev. Explor. Bot. Afr. Occid. Franç. 434 (1920), nomen ; Hutch. et J. M. Dalz. op. cit. 56 ; species foliis linearibus, caulibus et pedicellis glabris, floribus multicorymbosis distincta.

Herba suffrutescens circiter 1 m. alta, glabra. *Folia* opposita, linearia, usque ad 20 cm. longa et 1 cm. lata, viridia vel glaucescentia, costa infra valde conspicua. *Pedunculi* 4-5 cm. longi, leviter recurvati ; pedicelli 3-4 cm. longi ; bractae lineari-lanceolatae, 1-1.3 cm. longae. *Sepala* lanceolata, acuminata, 6 mm. longa. *Corollae* lobi obovato-elliptici, fere 1.5 cm. longi. *Coronae* lobi compressi, late cymbiformes, 6.5 mm. longi, 3 mm. lati, lateribus apicem versus in lobulis breviter triangularibus productis. *Folliculi* lanceolati, circiter 9 cm. longi, glabri, lineis latis notati. *Semina* ambitu anguste ovata, 6 mm. longa, minute verruculosa.

FRENCH GUINEA : Soarella, June, fls. rose and green, *Pobéquin* 1007. Ivory Coast : Mt. Kamouéniboka, near Marabadiassa, 200 m., July, *Chevalier* 22017 (type) ; Middle Sassandra, savannah plains, May, *Chevalier* 21798 ; Mankono, June, *Chevalier* 21849. GOLD COAST : Yeji, Aug., fls. blue, *Pomeroy* 1343. N. NIGERIA : Zungeru, by Dago stream, July, *Dalziel* 3 ; Aguji, near Ilorin, *Thornton*.

Schizoglossum Glanvillei Hutch. et J. M. Dalz. op. cit. 58; affine *S. angustissimo* K. Schum., sed caulibus ubique pubescentibus, foliis angustioribus differt.

Herba e rhizomate lignoso usque ad 0.75 m. alta; caules stricti, simplices, virides, lineis pilorum instructi. *Folia* sessilia, linearia vel late linearia, subacuta, basi angustata, 6-7 cm. longa, 5-6 mm. lata, costa media supra puberula excepta glabra. *Flores* virides, minimi, in pedunculis pubescentibus axillaribus gracillimis fasciculati; pedicelli filiformes, 5 mm. longi, puberuli. *Sepala* lanceolata, 1 mm. longa, membranacea, glabra. *Corollae segmenta* oblonga, obtusa, 3 mm. longa. *Coronae lobi* erecti, 1 mm. longi, breviter trilobati, lobis lateralibus triangularibus, terminale ovato. *Folliculi* leviter inaequales, 4-5 cm. longi, angusti, laeves. *Semina* oblonga, 5 mm. longa, pilis sericeis longis coronata.

SIERRA LEONE: Kulufaga, in Sambaia Chiefdom, up to 2 ft. high, Apr., *Glanville* 192 (type); Rowalla, fr. July, *N. W. Thomas* 1075; 1096.

Tylophora Deightonii Hutch. et J. M. Dalz. op. cit. 59; affinis *T. oculatae* N.E. Br., sed foliis basi haud cordatis differt.

Scandens, floribus pallide flavis; caulis glaber. *Folia* elliptica, basi late obtusa, apice acutissima, 3.5-5 cm. longa, 1.5-2.5 cm. lata, glabra, nervis lateralibus utrinsecus 4-5 tenuibus utrinque prominulis; petioli 5 mm. longi. *Cymae* pauciflorae, foliis aequales; bracteae triangulares, minimae, minute ciliolatae; pedicelli 6 mm. longi. *Calycis lobi* ovato-triangulares, acuti, 2 mm. longi, minutissime ciliolati. *Corolla* alabastro depresso-globosa, 5 mm. diametro. *Folliculi* immaturi ambitu lanceolati, rostrati, 2-5 cm. longi, glabri.

SIERRA LEONE: Hill Station, Oct., *Deighton* 219 (type).

Ceropegia Deightonii Hutch. et J. M. Dalz. op. cit. 62; affinis *C. pedunculatae* Turrill, sed foliis sessilibus, corollae lobis anguste linearibus longioribus differt.

Tuber subglobosum, circiter 1 cm. diametro; caulis simplex, gracillimus, leviter angulosus et interdum parce pubescens. *Folia* linearia, acuta, 3-4 cm. longa, 3-4 mm. lata, margine minute scabrido-ciliolata; petioli nulli. *Calycis lobi* subulato-lanceolati, 3 mm. longi, submembranacei. *Corollae tubus* 1.5 cm. longus, basi ventricosus, glaber; lobi liberi, lineares, 1.5-2 cm. longi, minute pubescentes et intra pilis purpureis deciduis ornati. *Coronae lobi* exteriores hyalini, lobis linearibus, interiores carnosii, ovoidei, longe acuminati. *Folliculi* lineares, anguste rostrati, stipitati, circiter 9 cm. longi, glabri. *Semina* lanceolata, 7 mm. longa, apice pilis sericeis coronata.

SIERRA LEONE: Foni flats, Waterloo, Aug., *Deighton* 2057 (type); Binkolo, frequent on granite outcrops, Aug., *Deighton* 1289; Rohilla, fr. June, *Deighton* 2743A; Russel, May, *Deighton* 2743.

The flowers are deep purple, and the violet purple hairs on the inside of the corolla-lobes seem to fall off quite readily. *Deighton*

states that plants of this species are found in the crevices of laterite rock and are very difficult to remove. It is common in all grass fields on laterite areas in the Colony except between Hamilton and Lumley. It occurs also by the roadside between Waterloo and Campbell Town, showing sometimes a slight tendency to twine.

Ceropegia Hepburnii Hutch. et J. M. Dalz. op. cit. 62; affinis *C. Dalzielii* N.E. Br., sed corollae tubo extra maculato apicem versus pubescente differt.

Tuber non visum; caulis erectus, apicem versus leviter pubescens. *Folia* non visa. *Flos* unicus tantum visus, pedicellatus, pedicellis parce pubescentibus; bractee subulatae, pubescentes. *Calycis lobi* lanceolati, acuti, 3.5 mm. longi, medio parce puberuli. *Corollae tubus* 3.5 cm. longus, subcylindricus, apicem versus expansus et pubescens, et extra maculatus; lobi e basi triangulari-ovato lineares, demum liberi, 4 cm. longi, parce ciliati. *Folliculi* breviter stipitati, 20 cm. longi, glabri.

N. NIGERIA: Randa, 650 m., rocky hills, May, *Hepburn* 57 (type).

Mr. Hepburn describes this as being tuberous, the flowers white with light purple spots on the corolla-tube, the lobes dark purple on the inner surface.

Brachystelma atacorensis A. Chev. Explor. Bot. Afr. Occid. Franç. 439 (1920), nomen; Hutch. et J. M. Dalz. op. cit. 65; affinis *B. Bingeri* A. Chev., sed floribus breviter pedicellatis, corolla extra glabra differt.

Herba perennis e tubero orta, e basi ramosa, 15–20 cm. alta; caules molliter pubescentes. *Folia* late oblanceolata, subacuta, ad basin angustata, 4–6 cm. longa, circiter 2 cm. lata, utrinque breviter pubescentia. *Flores* fasciculati, breviter pedicellati. *Calycis lobi* anguste ovati, acuti, leviter pubescentes. *Corolla* circiter 7 mm. longa, extra glabra.

DAHOMY: Atacora Mts.; Kouandé, 400–500 m., June, *Chevalier* 24013 (type).

XXXII--ADDITIONS TO THE FLORA OF CYPRUS: III.* A. K. JACKSON.

Sisymbrium polyceratum L. Sp. Pl. 658 (1753).

Kato-yialia, 11.6.34, 150 ft., on roadsides, *Syngrossides* 853. South and Western Europe, Mediterranean, Asia Minor, Syria.

Ononis Columnae All. var. **orientalis** Širjaev, Beih. Bot. Cent. 49, 2, 545 (1932).

In m. Pentedactylos, 26.5.1880, *Sintenis et Rigo* 404.

This specimen is quoted by Širjaev (l.c. 546) who also records the variety from Bulgaria, Greece, Asia Minor and Syria.

* Continued from K.B. 1936, 16.

Ononis mitissima L. Sp. Pl. 717 (1753).

In mont. supra Melanissiko, 26.5.1880, *Sintenis et Rigo* 646; Voroklini marshes (Larnaca district), in marshes, 30.4.36, *Syngrossides* 1006.

Širjaev (l.c. 641) records the plant from Cyprus and quotes the *Sintenis et Rigo* specimen. The species is common in the Mediterranean region.

Trifolium pilulare Boiss. Diagn. Ser. 1, 2, 29 (1843).

Koutrapha station, 13.4.36, 650 ft., on borders of fields, on rocky terraces, *Syngrossides* 1015.

Occurs in Asia Minor, Syria and Palestine.

Vicia lunata (Boiss. et Bal.) Boiss. et Bal. in Boiss. Fl. Or. 2, 594 (1872). *Ervum lunatum* Boiss. et Bal. in Boiss. Diagn. Ser. 2, 5, 93 (1856).

Hilly region of Kalapanayiotes, April 1917, 4000 ft., comm. W. Bevan; Makhaeras, April 1930, Druce; Platres, 17.3.36, 3000 ft., on rocky places, *Syngrossides* 949.

The specimens collected by Bevan and Druce were originally named *Vicia cypria* Kotschy. In naming the plant collected by *Syngrossides*, however, it was found that the Druce specimens had the remarkable semi-lunar pods of *V. lunata*. Further observation showed that these specimens differed from *V. cypria* in several other respects. The flowers are smaller and the standard of the corolla is almost entirely blue and has conspicuous veins; in *V. cypria* the standard has a blue blotch at the apex and the venation is not conspicuous. In *V. lunata* the style is reflexed over the dorsal edge of the young pod while in *V. cypria* the style curves down ventrally. The former species has hitherto only been found in Asia Minor, near Smyrna and at Takhtali-dagh. In Cyprus it appears at present to be confined to the Troodos range. The endemic *V. cypria* is found in the northern range at St. Hilarion and Pentadactylos and also on the east coast at Cap Greco.

Apium graveolens L. Sp. Pl. 264 (1753).

Myrtou, 1.4.36, 500 ft., wild in marshy fields near stagnant waters, etc. *Syngrossides* 1204.

Common in Europe and the Orient.

Ammi Visnaga (L.) Lam. Fl. Fr. 3, 462 (1778); Wolf in Engl. Pflanzenr. 90, 116 (1927); *Daucus Visnaga* L. Sp. Pl. ed. 2, 348 (1762).

In agris pr. Larnaka, Aug. 1880, *Sintenis et Rigo* 900; Livadhia-Larnaca distr., 6.6.35, 30 ft., in marshes, *Syngrossides* 836; Between Polis and Chrysochou, 12.6.34, 100 ft., on marshy fields, common, *Syngrossides* 967.

The species is recorded from Cyprus in the account of the Umbelliferae by Wolf in Engler's Pflanzenreich.

Common in the Mediterranean region.

Pimpinella cretica Poir. Encyc. Suppl. 1, 684 (1810).

Cap St. André, 24.4.1880, *Sintenis et Rigo* 337.

Recorded from Cyprus by Wolf (l.c. 235).

Occurs in Greece, Crete, Asia Minor, Syria, Palestine and Arabia.

Rubia Laurae (Holmb.) Airy-Shaw, comb. nov.

Galium Laurae Holmb. Stud. Veg. Cypr. (Berg. Mus. Skr. n. ser. I. no. 2) 171, fig. 56; 273 (1914).

Mari, east of Limassol, *Holmboe* 639 (typus; non vidi): "dry hill-sides, not rare in the southern part of the island."

In montibus prope Kythraea, Majo 1880, *Sintenis & Rigo* 526; in monte Pentedactylos, 8 Junio 1880, *Sintenis & Rigo* 526; St. Hilarion, above 150 m., on rocky ground, 11 May 1934, *Syngrossides* 671.

Holmboe remarks of this plant: "A very distinct species, which does not seem to be closely related to any other hitherto described." He apparently overlooked the fact that the flowers were pentamerous, a character which immediately excludes it from the genus *Galium*. In *Rubia*, § *Tinctoriae* K. Schum., to which this species must certainly be referred, the affinity is apparently with the small-flowered group with shortly apiculate petals, including *R. tinctorum* L. (Spain to Caucasus) and *R. fruticosa* Jacq. (Canaries). *R. tinctorum* is very distinct in its shortly tubular corolla and elongate anthers. *R. fruticosa* is, as its name implies, a shrubby species. From both these species *R. Laurae* differs further in its quite sessile, round-based leaves and purple flowers.

Both the collections of *Sintenis & Rigo* cited above were distributed as "*Rubia Olivieri* var. *stenophylla* Fl. Gr." Holmboe evidently never saw these specimens, as he records "*R. Olivieri* Rich. subsp. *R. Doniettii* Griseb." only on the authority of Post. Although Holmboe states that *R. Laurae* is "not rare in the southern part" of Cyprus, he collected it only once, and no other examples are known from the south. The specimens of *Sintenis & Rigo* and of *Syngrossides* are from a small area on the north coast. Evidently the distribution of this interesting endemic is far from fully worked out.—H.K.A.S.

Crucianella aegyptiaca L. Mant. 1, 38 (1767). *C. herbacea* Forssk. Fl. Aegypt. Arab. 30 (1775).

Perivolio (Kiti) towards Pháros, 1.5.36, 100 ft., on marshy fields, *Syngrossides* 1217.

This species was previously only known to occur in Egypt and Palestine.

Chrysanthemum Parthenium (L.) Bernh. Syst. Verz. Erf. 145 (1800). *Matricaria Parthenium* L. Sp. Pl. 890 (1753).

Platres, Troodos, 10.9.34, in vegetable gardens, in forests, *Syngrossides* 521.

Common in Europe and the Orient.

Sonchus asper Garsault, Fig. Pl. Anim. Med. 4, 332, t. 565 (1767); Hill, Herb. Brit. 1, 47 (1769).

Dithomo marshes, 9.3.36, 500 ft., on marshy places, *Syngrassides* 1032. This species is recorded by Druce (B.E.C. Rep. 9, 470 : 1931) from Nicosia.

A common weed with a cosmopolitan distribution.

Scorzonera laciniata L. Sp. Pl. 791 (1753).

By the bridge before Pyröi, 17.2.36, 200 ft., in marshes, *Syngrassides* 1047; Machinoditissa, 20.3.36, 300 ft., on borders of fields, *Syngrassides* 1108.

Mediterranean region.

Heliotropium supinum L. Sp. Pl. 130 (1753).

Pomos, 12.6.34, on arable land, *Syngrassides* 972; Ayios Andronikus, 14.8.34, in fields, *Syngrassides* 539.

Mediterranean region generally.

Convolvulus humilis Jacq. Coll. 4, 209, t. 22 (1790). *C. undulatus* Cav. Ic. 3, 39, t. 277, f. 1 (1795). *C. evolvuloides* Desf. Fl. Atlant. 1, 176, t. 49 (1798).

Ad varium margines pr. Hagios Georgios, 1.6.1880, *Sintenis et Rigo* 57; Dithomo, 9.3.36, 600 ft., on rocky arable lands, fls. blue, *Syngrassides* 1195.

Holmboe (Stud. Veg. Cypr. 145 : 1914) has a note on this species in which he says—" *C. undulatus* . . . has been indicated for the island under the name *C. evolvuloides* Desf. by Sibthorp, Prodr. 1, 134 (1806). But as this species has not been collected in the countries of the Levant by other botanists, the statement needs to be verified."

It can now be confirmed that this species does occur in Cyprus. Not only has it recently been collected by *Syngrassides* but there is also in the Kew Herbarium the *Sintenis et Rigo* specimen which was not seen by Holmboe.

The species is also found in Spain, Italy, Sicily, Palestine and North Africa.

Linaria longipes Boiss. et Heldr. in Boiss, Diagn. Ser. 1, 12, 40 (1853).

Ad maris litus pr. Larnaca, 9.3.1880, *Sintenis et Rigo*, 782; Shingle near Larnaca, April 1930, *Druce*.

This species has apparently been confused with *L. Cymbalaria* (L.) Mill. which has not been found in the island since Sibthorp and Smith recorded it in Prodr. Fl. Graec. 1, 430 (1806). The specimen collected by *Sintenis* and *Rigo* cited above was wrongly identified by them as *L. Cymbalaria*, and this bears out the views of Holmboe (Stud. Veg. Cypr. 145 : 1914) and *Druce* (B.E.C. Rep. 9, 470 : 1931) that the Sibthorp and *Sintenis* records of *L. Cymbalaria* are probably incorrect.

L. longipes is found in the islands of Chios, Rhodes, Salamis, and Crete, and also at Adalia in Asia Minor.

Atriplex patula L. Sp. Pl. 1053 (1753).

Platres, 10.6.34, on borders of fields, *Syngrossides* 522.

Common in Europe and the Orient.

Polygonum lapathifolium L. Sp. Pl. 360 (1753).

Yermessogia fields, 11.7.35, 60 ft., on borders of fields in vegetable gardens, *Syngrossides* 754; Syrianokhori 3.6.36, 50 ft., in hedges on borders of water channels, *Syngrossides* 977.

Europe, Asia, America.

Muscari pulchellum Heldr. et Sart. in Boiss. Diagn. Ser. 2, 4, 109 (1859).

In elatior. pr. Larnaca, 21.2.1880, *Sintenis et Rigo* 971; Ad monasterium Stavrovouni, 1.3.1880, *Sintenis et Rigo* 141; on the Bogaryi, Kyrenia distr., 28.1.34, 1500 ft., on slopes of mountains, rare, *Syngrossides* 969.

Mediterranean region.

Potamogeton natans L. Sp. Pl. 126 (1753).

Chrysochou, 12.6.34, 300 ft., in slow-running waters, *Syngrossides* 842.

This is apparently the first record of the genus *Potamogeton* from Cyprus. The species occurs in all the neighbouring countries.

Cyperus fuscus L. Sp. Pl. 46 (1753). Kükenthal in Engl. Pflanzenr. 101, 235 (1936).

Ayios Andronikos (Karpas), 20.6.34, in wet places, on borders of streams, *Syngrossides* 529. Kyrenia Bogaryi, near the date Palm, 10.6.35, 900 ft., growing on borders of running water, *Syngrossides* 955.

Kükenthal (l.c.) records this species from Cyprus, and it is fairly common in Europe and the Orient.

Echinochloa crus-galli (L.) Beauv. Agrost. 53 (1812) var. **aristata** Rehb. Ic. Fl. Germ. 1, t. 29, f. 1412 (1834). *Panicum crus-galli* L. Sp. Fl. 56 (1753).

Platani above Kakopetria, 8.7.35, 3000 ft., in ditches with running water, *Syngrossides* 748; Syrianokhori, 13.8.35, 50 ft., in marshes, *Syngrossides* 747.

This variety is generally distributed in the Mediterranean region and Eastern Asia.

Crypsis Factorovskyi Eig in Zionist Org. Inst. Agric. Nat. Hist. Bull. 6, 58 (1927).

Cyprus, 24.9.1860, *Hooker and Hanbury*; Machinoditissa, 8.9.35, 150 ft., in dry water ditches, *Syngrossides* 793.

This species, which was originally described from Palestine, also occurs in Asia Minor and Syria.

Alopecurus myosuroides Huds. Fl. Angl. 23 (1762). *A. agrestis* L. Sp. Pl. ed. 2, 89 (1762).

Platres, 17.3.36, 3000 ft., on borders of fields in thickets, *Syngrossides* 946.

Europe and the Orient.

Calamagrostis epigeios (L.) Roth, Tent. Fl. Germ. 1, 34 (1788).
Arundo epigeios L. Sp. Pl. 81 (1753).

Cyprus, 1929, C. B. Ussher 36; Prodromo, nr. Trikkoulhia, 10.7.35, 5000 ft., in gardens, in rich soils, *Syngrassides* 800.

Europe, the Orient and Northern Asia.

Gastridium ventricosum (Gouan) Schinz et Thellung in Vierteljahrsschr. Nat. Ges. Zurich 58, 39 (1913). *Agrostis ventricosa* Gouan, Hort. Monspel. 39, t. 1, f. 2 (1762).

In agris montium supra Kythaea, 24.5.1880, *Sintenis et Rigo* 364. Peristerona, 3.6.36, 200 ft., in running water and on borders of water channels, *Syngrassides* 984. Platania station (Kakopetria), 29.6.36, 3700 ft., on borders of forest roads, *Syngrassides* 1090.

Cosmopolitan.

Aegilops bicornis (Forssk.) Jaub. et Spach. Illustr. Pl. Pr. 4, 10 (1850-53). *Triticum bicornis* Forssk. Fl. Aegypt. Arab. 26 (1775).

Ayios Irene (Myrtou), 30.3.36, on sandy soils, *Syngrassides* 1206.

Druce also collected this species at Salamis (B.E.C. Rep. 9, 471: 1931). It was hitherto only known to occur in Egypt.

Hordeum spontaneum C. Koch in Linnaea, 21, 430 (1848). *H. ithaburense* Boiss. Diagn. Ser. 1, 13, 70 (1853).

Athalassa-Oronas, 27.3.36, 300 ft., on the hill slopes near the top, *Syngrassides* 1173.

Asia Minor, Syria, Palestine.

Notholaena vellea (Ait.) Desv. Journ. de Bot. appl. 1, 92 (1813). *Acrostichum velleum* Ait. Hort. Kew, 3, 457 (1789).

Ad rupes m. Pentedactylos, Majo 1880, *Sintenis et Rigo* 100. Skouriotissa, 6.5.27, 1000 ft., Rev. Alfred Huddle 119. Dikomo (Paschali chiflik), 20. 5. 36, 1000 ft., on huge rocks, *Syngrassides* 990.

Generally distributed in the Mediterranean region.

XXXIII—NOTES ON FERNS AND FERN ALLIES: I.

MISCELLANEOUS NOTES. F. BALLARD.

Trichomanes clarenceanum F. Ballard, nom. nov. *T. dilatatum* (v. d. B.) Kuhn, Fil. Afr. 33 (1868) non Forst. *Didymoglossum dilatatum* v. d. Bosch. in Ned. kr. Arch. 5, 144 (1863).

Didymoglossum dilatatum was based on a specimen from Fernando Po and was later reduced by C. Christensen in his Index Filicum to *Trichomanes bipunctatum* Poir. An examination of the type, however, in the Kew Herbarium makes it clear that v. d. Bosch's species is quite distinct from *T. bipunctatum*, though it belongs to the same group. The most striking difference between the two lies in the sorus. In *T. bipunctatum* the involucre is an elongate, tubular, non-flaring structure with conspicuous, triangular, acute or subacute lips. The involucre in *Didymoglossum dilatatum* is shorter, more funnel-shaped and with a dilated mouth; the lips, if they can be so described, are very short and obtusely rounded.

The last named also is a smaller, less-dissected species than *T. bipunctatum* with stripes not exceeding 7 mm. long. There is also a very much interrupted and somewhat irregular spurious vein running round the margin, whereas the spurious vein in *T. bipunctatum* is in most cases continuous.

The name *Trichomanes dilatatum* is already occupied by Forster for the plant now known as *Hymenophyllum dilatatum* (Forst.) Sw. and a new name is therefore proposed.

Trichomanes guineense Afz. ex Sw. in Schrad, Journ. Bot. 1800, ii. 96 (1801). *T. Hartii* Bak. in Gard. Chron. n.s. 18, 680 (1882). *T. latisectum* Christ. in Journ. de Bot. 22, 20 (1909). Copeland has described *T. batrachoglossum* in Philip. Journ. Sci. 51, 244, t.50, 51 (1933) from Liberia. Two Liberian specimens in the Kew Herbarium, Cooper 38 and Linder 1291, match Copeland's photograph and figures exactly and these specimens are certainly referable to *T. guineense* Afz.

T. liberiense Copel. in Philip. Journ. Sci. 51, 160, t.9 (1933).

Specimens of this tiny fern originally described from Liberia have appeared on Kew sheets of specimens received under other names. Zenker 1994 collected as far east as Bipinde in French Cameroons and distributed as *T. muscoides* Sw. proves to be this species. Also, the Kew sheet of Zenker 995 from the same locality and bearing the name *T. pyxidiferum* L. consists of *T. liberiense* Copel. and *T. melanotrichum* Schlechtend. in about equal proportions. No doubt *T. liberiense* will be found in other localities lying between Liberia and the Cameroons. Its extremely small size (the fronds rarely exceed 5 mm. in length) render it somewhat inconspicuous and liable to escape the eye of the average collector.

T. Motleyii v. d. Bosch, cited by R. Bonaparte in Notes Pteridol. 1, 47 as occurring in Loango is probably this species. Engler also mentions *T. Motleyi* from the Cameroons in Die Pflanzen. Afrikas, and here again it is probable that the plant referred to is *T. liberiense*.

Dryopteris Makinoi Koidz. in Acta Phytotax. 1, 26 (1932). *D. obtusissima* Mak. in Journ. Jap. Bot. 2, 47 (1918).

Dryopteris obtusissima Mak., under which *D. Makinoi* is sunk in C. Chr., Ind. Fil. Suppl. 3, is illegitimate by reason of *D. obtusissima* (Mett.) Christ in Journ. de Bot. 21, 231 (1908).

Dryopteris Parksii Ballard, nom. nov. *D. microsora* Copel. in Bern. P. Bish. Mus. Bull. 59, 12 (1929) non O. Ktze. Rev. Gen. Pl. 2, 813 (1891).

Dryopteris guadalupensis (Fée) O. Ktze. Rev. Gen. Pl. 2, 812 (1891) non (Wikstr.). C. Chr. in Biolog. Arb. tilegn. Eug. Warming 84 (1911). *D. nephrodiodides* (Kl.) Hieron. in Hedwigia 46, 327 (1907) non O. Ktze. Rev. Gen. Pl. 2, 811 (1891).

This fern has been known generally as *Dryopteris nephrodioides* (Kl.) Hieron., an illegitimate name, since it is a later homonym for a plant described by Kuntze.

Pellaea calomelanos (Sw.) Link Fil. Sp. hort. Berol. 61 (1841). *Pteris calomelanos* Sw. in Schrad. Journ. Bot. 1800, ii. 70 (1801); *P. hastata* Thbg. Prodr. Pl. Cap. 172 (1800) quoad specim. non (L.) Thbg. In 1800 Thunberg (Prodr. 172) identified a plant with *Adiantum hastatum* L.f., Suppl. Plant. Syst. Veg. 447 (1781) and made the combination *Pteris hastata* (L.f.) Thbg. Although Thunberg had misidentified his plant, the combination made by him, in accordance with the Rules of Nomenclature (Ed. 3), stands, while the plant itself remains nameless. Swartz in 1801 (Schrad. Journ. Bot. 1800, ii. 70) again made the combination *Pteris hastata*, basing the name as before on the plant described by the younger Linnaeus. This was, of course, unnecessary, as the combination had already been made by Thunberg. In the same publication, however, Swartz makes the combination *Pteris calomelanos* for the specimen seen by Thunberg and misidentified by him with *Adiantum hastatum* L. f. This is the first legitimate name for Thunberg's plant. Prantl's name, *P. hastata* (Thbg.) is superfluous.

Pteris pteridioides (Hook.) Ballard, comb. nov. *Hypolepis pteridioides* Hook., Sec. Cent. t.59 (1861). *Pteris brevisora* Bak. Syn. Fil. 162 (1867).

Baker's name for this Tropical African fern was accepted by C. Christensen in his Index Filicum, as he apparently regarded Hooker's early epithet as a later homonym of the American *Hypolepis pteroides* Mett.

Pteris aspericaulis Wall. ex Agardh, Recens. Gen. Pter. 22 (1839). This name first appeared in Wallich's Catalogue (1828) but remained a "nomen nudum" until 1839, when Agardh supplied a description in his revision. The plant introduced to cultivation in 1861 as *P. rubro-nervia* by Linden is apparently identical with *P. aspericaulis*.

Pteris Mannii Baker Syn. Fil. 168 (1867). This species is an undoubted *Lonchitis*, and comparison with a large number of specimens has shown it to be based on young, simply-pinnate fronds of *Lonchitis Currori* (Hk.) Kuhn in Bot. v. Ost.-Afr. 10 (v. d. Decken's Reisen in Ost.-Afr.) (1879).

Polypodium glaucophyllum Kze. var. *Irvingii* Ballard var. nov.; a typo rhizomate tenuiore, foliorum laminis angustioribus haud glaucis costae mediae utrinque areolarum seriibus tribus praeditis differt. *P. Irvingii* Kuhn, Fil. Afr. 147 (1868); *P. glaucophyllum* Kze. var. β Hook. Sp. Fil. 5, 18 (1864).

It is impossible to maintain Dr. E. G. Irving's plant from Southern Nigeria (Abeokuta) as specifically distinct from the American *P. glaucophyllum* Kze. It is doubtful indeed whether the African plant would have invited attention at all if it had borne an

American label. As it is, it stands as the only example of the subgenus *Goniophlebium* to be found in Tropical Africa and it is strange that no collector since Irving's day (he died in 1855) has rediscovered the plant.

The African material is smaller than the average of the American, with a slightly thinner rhizome and narrower non-glaucous blades. There are three series of aeroles each side of the costa, whereas in the American plant there are usually at least five such series. *P. caudiceps* (Moore) Nichols. (*Goniophlebium caudiceps* Moore), based on a cultivated specimen and said to have come originally from Formosa, is apparently closely related to the African plant. C. Christensen is probably right (in litt.) in supposing the locality "Formosa" to be incorrect, though its actual origin is probably American rather than Tropical African.

Polypodium caudiceps (Moore) Nichols. Dict. Gard. 4, 592 (1888).

P. fossum (Moore) Nichols. l.c.

P. xiphias (Moore) Nichols. l.c.

These combinations are attributed to Baker (1891) in C. Chr. Ind. Fil.

Drynaria rigidula (Sw.) Bedd. var. ***Vidgenii*** (F. M. Bail.) Ballard, comb. nov. *Polypodium rigidulum* Sw. var. *Vidgeni* F. M. Bail. in Syn. Queens. Flora, 718 (1883). *Polypodium Vidgeni* Hort.

This plant, which was exhibited in London in 1912 by Messrs. May, is figured in Bailey's "Ferns of Queensland," t. 166 (1892). It differs from the type in the pinnae, which have lacinate margins.

Drynaria rigidula (Sw.) Bedd. var. ***Whitei*** (F. M. Bail.) Ballard, comb. nov. *Polypodium rigidulum* Sw. var. *Whitei* F. M. Bail. in Queensl. Agric. Journ. 27, 306 (1911).

This variety, collected originally on the Glasshouse Mountains in Queensland, is similar to the last named but possesses wider and more deeply cut pinnae.

Pyrrhosia africana (Kze.) Ballard, comb. nov. *Niphobolus africana* Kze. in Linnaea 10, 501 (1839). *Cyclophorus africanus* (Kze.) C. Chr. Ind. Fil. 197 (1905).

It is unfortunate that *Cyclophorus* Desv. (1811) is antedated by *Pyrrhosia* Mirbel (1803) as it involves the making of a large number of new combinations for plants which have borne their present names in many cases for long periods of time. R. C. Ching has already published (Bull. Chin. Bot. Soc. 1 [1935]), fifty new combinations under *Pyrrhosia*.

Platyserium grande (Fée) Pr. Epim. Bot. 154 (1852). This name has been attributed in all fern literature to (A. Cunn.) J. Sm. The fern was originally named *Acrostichum grande* by its discoverer, A. Cunningham, although the name was never validated by a

published description. A mention of it is made in Hook. Bot. Misc. i, 240 (1830) but again without description. J. Smith, in 1841, (Hook. Journ. Bot. 3, 402) transferred the plant to *Platycerium*, but this name is also a *nomen nudum*.

In 1845, however, Fée (2me. Mém. 103) published the combination *Neuroplatyceros grandis*, together with an adequate description. This constituted the first valid publication of the species.

Elaphoglossum alpinum Ballard nom. nov. *Acrostichum tenerum* Fée ex Kuhn in Linnaea 36, 52 (1869). *E. tenerum* (Fée) Hieron. in Engl. Bot. Jahrb. 34, 557 (1904) non H. Chr. Mono. Elaph. 62 (1899).

Acrostichum tenerum Bak., Journ. Bot. 16, 302 (1878) is an illegitimate name by reason of the earlier homonym of Fée. Christ's transference of Baker's species to *Elaphoglossum*, however, produced a legitimate name (Art. 69), *E. tenerum* H. Chr., which should be used instead of *E. Balansae* C. Chr. Ind. Fil. 303 (1905), which is superfluous. *E. tenerum* (Fée) Hieron., being a later homonym, is illegitimate and a new name is necessary.

XXXIV—THE CORRECT NAME OF THE YELLOW HYBRID ASTER. M. L. GREEN.

Several enquiries have been received at Kew as to the correct name for the well-known garden hybrid between *Aster ptarmicoides* (Nees) Torr. & Gray and an unknown species of *Solidago*.

From time to time articles have appeared dealing with this plant. In the Gardeners' Chronicle, 1931, 89, p. 67, a short note was written by "Kent" under the name *Solidago missouriensis*. "Kent" states that the plant has long been known in cultivation under the title of "*Aster hybridus luteus*," and he proceeds to give a horticultural description, not a technical description, under the name *Solidago missouriensis*. "*Aster hybridus luteus*" can be regarded only as a phrase name meaning a yellow hybrid aster.

In reply to this note Mr. D. J. Ruys in Gard. Chron. 1931, 89, p. 117, pointed out that the plant was not *Solidago missouriensis* Nutt., and suggested that it would be better to revert to the old name "*Aster hybridus luteus*."

Later on in the same year, in Gard. Chron., 1931, 89, p. 190, Mr. G. Arends wrote an account of the hybrid origin of this plant, and again called it "*Aster hybridus luteus*." About five months later, Mr. A. D. Cotton and Mr. E. Milne-Redhead, after an examination of the plant, also came to the conclusion that it was not the true *Solidago missouriensis*, nor could it be included in the genus *Aster*—as that genus is generally defined to-day. Mr. Cotton, in a note to the Gardeners' Chronicle, 1931, 90, p. 147, stated that the plant was probably a bigeneric hybrid; here also the plant was referred to by its phrase name "*Aster hybridus luteus*."

Some years later in Gard. Chron. 1937, 91, p. 6, Mr. T. H. Everett, of New York, tried to clear up the confusion that existed

among horticulturists concerning the correct name of the hybrid in question. He gave a clear account of the history, and of the various trade names under which the plant had been known. He again recognized the bigeneric character of the hybrid, and gave it a technical name, *Asterago lutea*, accompanied by a description, thereby validating the specific epithet according to the International Rules of Botanical Nomenclature. Mr. Everett illustrated his article by three photographs: (1) *Asterago lutea*, (2) *Aster ptarmicoides*, and (3) *Solidago missouriensis*.

Thus for the first time as far as can be ascertained a valid name was given to the hybrid.

This account by Mr. Everett, however, led to a reply by Mr. Arne Thorsrud in Gard. Chron. 1937, 91, p. 83, pointing out that another name, namely, *Solidaster hybridus* had already been given to the plant by Mr. H. R. Wehrhahn in C. Bonstedt's "Pareys Blumengärtnerei," which was printed in Berlin in 1932. He further remarks that in Norway where the hybrid is much esteemed it has been listed under this name for several years.

As Bonstedt's work is not in the Kew library, the help of Professor Harms of Berlin was solicited, and he very kindly informs us that in the work referred to, Wehrhahn, who is responsible for the Compositae, stated that a hybrid of *Aster ptarmicoides* with an unknown species of *Solidago* is in cultivation under the misleading name of *Solidago missouriensis* or "*Aster hybridus luteus*." He then proceeded to give it the new name *Solidaster hybridus*.

The "generic" name *Solidaster* was validated under International Rules, Art. 32, by the indication of the two genera between which the cross was made. The so-called "generic" names of bigeneric hybrids, unlike true generic names, do not require the provision of a description in order to validate their publication. They really correspond to a telescoped formula. Thus \times *Solidaster* is an abbreviation of *Solidago* and *Aster*.

As the name *Solidaster* antedates *Asterago* it stands as the "generic" name of the hybrid.

The specific name *Solidaster hybridus*, however, was not validly published, as it was not accompanied by a description, nor by a reference to a previously and effectively published description (see International Rules, ed. 3, Art. 37). The correct name of the hybrid therefore becomes \times *Solidaster luteus* (Everett) M. L. Green (*Aster ptarmicoides* \times *Solidago* sp.).

It is possible that in some horticultural journals or elsewhere, a technical description of *Solidaster hybridus* may have been published, but up to the present it has not been traced.

The following is a list of synonymy:—

\times **Solidaster** *Wehrhahn* in C. Bonstedt, Pareys Blumengärtnerei, 2, 525 (1932).

\times *Asterago* Everett in Gard. Chron. 1937, ser. 3; 91, 6.

- × *Solidaster luteus* (Everett) M. L. Green, comb. nov.
- × *Solidaster hybridus* Wehrhahn, l.c.
- × *Asterago lutea* Everett, l.c.

XXXV—ON THE STATUS OF THE NAME *BURSERA SUBSESSILIFORMIS* ENGL. A. A. BULLOCK.

In the second edition of the "Pflanzenfamilien" (Band 19a, 426: 1931) Engler appears, at first sight, to have omitted the species *Bursera submoniliformis* Engl., which was included in the first edition (3, 4, 251: 1896), as well as in his original monograph of the genus (DC. Monogr. 4, 55: 1883). In a comparable position in the key, however, he placed *Bursera subsessiliformis*, Engl., a name previously unpublished.

The writer had the privilege some time ago of examining the material of *Bursera* in the Berlin herbarium,* and the name *B. subsessiliformis* was not seen on any sheet. The absence of the name in the Berlin herbarium has been confirmed by Dr. Harms (in litt. 25 May 1937).

The writer suspected that Engler's *B. subsessiliformis* was a lapsus calami, since the description of *B. submoniliformis* in the first edition of the "Pflanzenfamilien" and that of *B. subsessiliformis* in the second edition, were almost identical. These, extracted from Engler's keys, are given below in tabular form, the reference letters being omitted:—

Ed. 1, 3, 4, p. 251.

BURSERA SUBMONILIFORMIS.

Blattstiel schmal oder breit geflügelt.
Blätter einpaarig-gefiedert, bis-
weilen einzelne gedreht.

Die ausgewachsenen Blätter beid-
erseits ± dicht behaart.

Die Adern der Blätter unterseits
nicht hervortretend, die Seit-
ennerven bisweilen deutlich.

Blättchen am Rande gekerbt oder
gesägt.

Blüten gestielt.

B. submoniliformis (L. March.) Engl.
mit dicht gelbfilzigen, dünnen,
6-paarigen Blättern, in Mexiko.

Ed. 2, 19a, p. 426.

BURSERA SUBSESSILIFORMIS.

Blattstiel und Rachis ± geflügelt.
Blätter einfach gefiedert.

Ausgewachsene Blättchen beider-
seits behaart.

Blättchen nicht lederartig.

Blättchen ± gezähnt.

Blüten gestielt.

Früchte behaart.

B. subsessiliformis Engl. in Oaxaca.

It will be observed that the only essential differences in the two descriptions consist of the additional information that the fruit of *B. subsessiliformis* is hairy, and that it occurs in Oaxaca, whereas the

*Kew Bull. 1936, 346.

fruit of *B. submoniliformis* was unknown, and the species was given the much less definite habitat "Mexiko."

In Engler's original description of *B. submoniliformis* the *locus classicus* is stated to be "Río Vuellas" where it was collected by Liebmann, and Engler was apparently unaware that this locality is in the state of Oaxaca. This information was supplied by Rose (N. Amer. Fl. 25, 255: 1911), who also described the fruit as pubescent. It is evident that Engler made use of this additional information in the second edition of the "Pflanzenfamilien."

A further point in favour of the argument that *B. subsessiliformis* is a lapsus calami for *B. submoniliformis* is to be found in the fact that one of the names immediately preceding it is *B. sessiliflora*, and it is thus easy to see how *B. subsessiliformis* may have been written in place of *B. submoniliformis*.

XXXVI—NOTES ON CAREX: I.

A NEW SPECIES FROM THE MALAY PENINSULA. E. NELMES.

In 1925 Mr. M. R. Henderson, Curator of the Singapore Botanic Gardens, collected a sedge on Cameron's Highlands, in the State of Pahang, Malay Peninsula. The locality is a wet spot above the main forest zone which has been cleared of its trees and drained, so that the plant, which proves to be new, may soon be lost.

Carex elibates Nelmes, sp. nov.; affinis *C. maculatae* Boott, sed foliis rigidioribus culmo brevioribus, spica terminali normaliter gynaeacandra, spicis magis approximatis brevioribus elliptico-oblongis, utriculis rostratis vel brevissime rostratis differt.

Culmi caespitosi, usque ad 30 cm. alti, e rhizomate brevi orti, graciles, rigidi, angulis apicem versus scabridis. *Folia* angusta, 2-3 mm. lata, rigida, culmis plerumque breviora, marginibus et supra nervis scabrida, pallide viridi-glauescentia, planiuscula, tenuiter striata, culmorum basin versus numerosa et conferta, vaginis conspicuis rubido-brunneis membranaceis. *Spicae* 3-5, plerumque 4, breves, 1-2 cm. longae (pedunculo excluso), approximatae vel infima nonnunquam plus minusve distans, elliptico-oblonga, inferiores pedunculatae, superiores subsessiles, castaneae, terminalis basi interdum apice mascula raro omnino mascula, ceterae omnino femineae. *Bractaeae* foliaceae, strictae, duae inferiores inflorescentiam superantes, supra et marginibus scabrae, vaginantes, inferiorum vaginis 6-12 mm. longis. *Squamae* ovatae vel ellipticae obtusae vel acutiusculae, nonnunquam mucronulatae, carinatae, carina dorso viridi, castaneae. *Utriculi* late elliptici, sed glumis aequilongi vel paullo longiores, rostrati vel brevissime rostratis, 2-2.5 mm. longi, dorso prominenter 5-6-nerves, facie planiuscula tenuiter nervosi, marginati, dense et minutissime rubro-papilloso. *Nux* late elliptica, 1.5 mm. longa, trigona, minutissime papillosa. *Stylus* modice crassus. *Stigmata* 3.



Carex elibates Nelmes. 1, complete plant; 1a, inflorescence with terminal spike wholly male; 1b, normal inflorescence; 2, female glume; 3, utricle; 4, nut. 1-1b, natural size; 2-4, $\times 12$.

MALAY PENINSULA: State of Pahang; Batu Brinchang, Cameron's Highlands, 2,000 m., on the cleared top of the hill, Nov. 22, 1925, fruiting, *M.R. Henderson* 17,901 (type); April 9, 1930, immature, *Holtum* sine num.; April 9, 1930, fruiting, *Holtum* 23,527; May 25, 1931, fruiting, *Symington* 20,839; summit of Gunong Irau, April 14, 1934, fruiting, *Symington* 36,554.

The nearest ally of *C. elibates*, *C. maculata* Boott, occurs from India to Japan and Sumatra, and its var. *neurochlamys* (F. Muell.) Kükenth. in north-east and east Australia and in Polynesia.

These species belong to a section of the subgenus *Eucarex* Coss. et Germ., by far the largest of the four subgenera of *Carex*, and common in temperate regions but rarely found in the tropics. There are, in fact, very few tristigmatic members of *Eucarex* found in Malaya, and equally few other species of Malayan *Eucarex* belong to the distigmatic section *Acutae*. The greater number of the Malayan *Carices*, numbering about forty, are placed in the small paniculate subgenus *Indocarex* Baill., which is almost unrepresented in temperate regions. Tropical species mainly belong to *Indocarex*.

The most interesting point about *C. elibates*, however, is that it differs from *C. maculata* and most other species of *Eucarex* in the nature of its terminal spike. About 90 per cent. of the members of *Eucarex* have one or more of their upper spikes wholly male, while the lower ones are female, sometimes with male tips. The remaining 10 per cent., mainly comprising the section *Atratae*, have all their spikes female, except that the terminal spike is male at the base. The *Atratae* are mainly arctic and mountain species, and the gynaeandrous* nature of their terminal spike may bear some relation to their type of habitat. Now, *C. elibates* shows, in the four gatherings from Cameron's Highlands, three types of terminal spike. The majority of the culms have the terminal spike female with a male base, but in a few this spike is wholly male, and in several others male at both ends with some female flowers in the middle. *C. elibates* is almost unique in this variable character, and may represent a link in the evolution of the gynaeandrous state.

It should be mentioned that *C. elibates*, though apparently allied to the *Atratae*, by reason of its gynaeandry, has stronger affinities with the section *Maximae* Aschers., which, incidentally, includes several gynaeandrous species. Its nearest ally, however, *C. maculata* Boott, invariably has a male terminal spike.

XXXVII—MISCELLANEOUS NOTES.

SIR DAVID PRAIN.—Sir David Prain celebrated his 80th birthday on Sunday, July 11th. To mark the occasion a letter was sent to Sir David, signed by ninety-five former colleagues and scientific

* The term *gynaeandrous* is used by Kükenth in *Carex* to denote a spike (*spicula*) in which the upper flowers are female and the lower ones male, as in the terminal spike of *Carex nigra* All.

friends, conveying their congratulations. In the course of the letter, the hope was expressed that Sir David may continue for many years to enjoy good health and be able to carry on the many activities which are so greatly benefited by his wide knowledge and sympathetic interest. This wish will be echoed by all who have been privileged to know him.

DR. E. G. S. BROWN.—E. G. S. Brown, B.Sc., PhD., Assistant Lecturer, Department of Botany, University of Edinburgh, has been appointed to the post of Temporary Botanist in the Herbarium, to succeed Mr. A. R. Horwood, whose death was recorded in K.B. 1937, 121.

SIR CECIL HANBURY.—We have to record with deep regret the death on June 10th of Sir Cecil Hanbury, M.P., at the age of 66.

Among horticulturists Sir Cecil will be remembered for the remarkable garden at La Mortola, near Ventimiglia, which was founded by his father, Sir Thomas Hanbury, and which Sir Cecil and Lady Hanbury developed into one of the finest private gardens in Europe. In addition to the collection of living plants, which was especially rich in representatives of the floras of South Africa, and South and Central America, a botanical museum, herbarium and library are maintained.

A few weeks before his death, Sir Cecil had brought to Kew, for checking, the manuscript of a new edition of the list of plants growing at La Mortola, which had been compiled by Lady Hanbury and himself. This list includes a history of the gardens, and it is hoped that it will shortly be published.

Under Sir Cecil's direction, the relationship between La Mortola and Kew has been very close. Not only has constant interchange of plants and seeds taken place, but, several years ago, it was arranged for a Kew student to spend a year at La Mortola, while an Italian gardener took his place in England. This exchange of students has since been continued, to the mutual benefit of both establishments. It is interesting to note that out of this arrangement has grown the present series of exchanges, at present numbering thirteen, between Kew students and young gardeners in Empire and foreign countries in many parts of the world.

In addition to his work for horticulture, Sir Cecil's activities extended into many and varied fields. He served in the Admiralty and Foreign Office during the War, and had been the Member of Parliament for North Dorset since 1924.

As a member of the Governing Body of the Imperial College of Tropical Agriculture, Trinidad, Sir Cecil's wide experience and sound judgment were of great service. Always a wise counsellor and a kind and generous friend, his loss will be deeply felt not only at Kew but by a very large circle of his friends and colleagues.

SIR OSCAR EMANUEL WARBURG.—We record with deep regret the death on July 1st of Sir Oscar E. Warburg, O.B.E., at the age of 61.

Sir Oscar, who was Chairman of the London County Council in 1925-26, was a keen botanist, and at his garden at Boidier, near Epsom, he had brought together a fine collection of plants, especially *Quercus*, *Cistus* and *Sorbus*. On the first two genera he and his son, Dr. Edmund Warburg, were recognised authorities, and they published valuable papers on them in the "Journal of the Royal Horticultural Society" (vol. 58, p. 176, and vol. 56, p. 1).

Sir Oscar paid frequent visits to the Mediterranean to study and collect cistuses and he was in touch with botanists in all parts of the world, who sent him acorns and young plants for his collection of oaks. Sir Oscar was a good friend to Kew, and was always ready to share with the Gardens material of rare or interesting plants. His untimely death will be a real loss to the horticultural world.

The Treub-Foundation.—In memory of Dr. Melchior Treub, the celebrated Director of the Botanic Gardens, Buitenzorg, a Treub Fund was established with monies collected in the Netherlands East Indies. This has now been constituted as the Treub-Foundation and has been given proper legal status.

The Foundation is intended to co-operate in maintaining and in extending the scope of the scientific institutions united under the name of the Government Botanic Gardens in Java, especially the Botanic Gardens at Buitenzorg, the Mountain Gardens at Tjibodas, the Treub Laboratory, the Herbarium and the Marine Laboratory at Batavia.

The Foundation intends to support research and issue publications; the publication of Dr. Docters van Leeuwen's recent fine Treatise on Krakatau, it may be mentioned, was largely subsidised from the fund.

Donors, Patrons, Subscribers and Corresponding Members have been instituted—Donors contributing Fl. 500, or Fl. 1,000 in the case of Corporations, Patrons Fl. 100 and Subscribers Fl. 10 annually.

Corresponding Members will be those who have rendered service to the Gardens or contributed to research in the East Indies and would be given facilities for working in the Gardens or Laboratories. The Director has been asked by the Board of the Foundation to be a Corresponding Member and to collect any monies that may be contributed in Great Britain for the purposes of the Foundation, and he has agreed to act in that capacity. Any contributions, therefore, should be sent to Sir Arthur W. Hill, Royal Botanic Gardens, Kew, who will forward them to the Secretary of the Fund at Buitenzorg.

Ricinodendron Rautanenii in Nyasaland.—A specimen (no. 757) received from Mr. J. B. Clements, Conservator of Forests, Nyasaland, bearing the names "Mkomwa" (chiNyanja) and "Mkan-gaula" (chiYao) proves to be *Ricinodendron Rautanenii* Schinz; it was collected on the Lake Plain in the South Nyasa District. This is the first record of this species from Nyasaland, though it is common in the Zambesi Basin in Southern and Northern Rhodesia.

The occurrence of the genus *Ricinodendron* in the "low country" of Eastern Tropical Africa tends to confirm a suggestion made by the writer some years ago that the deep narrow and hot gorge of the Zambesi had acted as a corridor for the migration of low country species from the Eastern Coastal Plain westward onto the plateau of Central Africa, at altitudes greater than those normally reached by similar floristic types. It adds one more link in the chain of confirmatory evidence that at some earlier geological time the forest of Central Africa was more homogeneous than it is to-day, and that genera peculiar to low elevations in Tropical Africa then ranged from east to west of the Continent, this distribution having been broken by a subsequent elevation of the plateau, with a consequent lowering of the minimum temperature.

J. BURTT DAVY.

British Trees and Shrubs.*—The aim of this volume is set forth by the author as follows: "In this book I have attempted to teach students to distinguish our native woody plants and many cultivated ones by means of curt diagnoses somewhat like those that are the strength and beauty of Hooker's *Student's Flora*; I have shown how these plants fit into, and illustrate, Engler's System, which I still believe to be the best system devised; and lastly I have tried to show in footnotes that the names by which botanists call these plants are no mere abracadabras put together by illiterate scientists, but that many, at any rate, of them are words known and understood by educated men for at least 2,000 years."

The volume thus forms a companion to the same author's "Catkin-Bearing Plants" published some years ago, and will undoubtedly receive a welcome from those who appreciated the clear descriptions and original treatment of the earlier volume.

On the whole, the author has successfully carried out his threefold plan. It might be reasonably objected that some of the "curt diagnoses" are too curt, and fail to give a picture of the plant adequate for identification. Some of the genera, however, are more fully treated, and in *Ulmus* the result is one of the best short accounts of the British elms available.

In the preface, and at the beginning of the sections on many of the major groups, Mr. Gilbert-Carter makes brief but suggestive remarks on questions of relationship and phylogeny.

* "British Trees and Shrubs, including those commonly planted: a systematic introduction to our Conifers and woody Dicotyledons." By H. Gilbert-Carter. Clarendon Press, Oxford, 1936. Pp. xv+291. Price 12s. 6d.

The author points out that modern specialization is far from being an unmixed blessing: "In Cambridge, and probably elsewhere, the student of science never refers to a Latin dictionary, which he considers as outside his life and work, while the student of classics often conceives science as outside the bounds of civilization" (preface, p. xiii). Among professional botanists, wide-spread ignorance of the meaning of botanical names, and continual mispronunciation of them, are a natural result of this narrow mental attitude. So far as the names of British trees and shrubs are concerned, however, the concise derivations and indications of pronunciation now supplied by Mr. Gilbert-Carter will remove all excuse for ignorance or solecism. This part of the work is admirable: it is only occasionally that the author has guessed at a derivation, as in *Abutilon megapotaamicum*, so named, not because of "growing by the great river (the Amazon)" but because it is a native of the State of Rio Grande do Sul, in the extreme south of Brazil.

All long vowels are marked with the usual straight line, the short vowels being unmarked. A few simple rules of pronunciation given in the Introduction are here reproduced:—

"ACCENT. Plant names must be treated as Latin words and conform to the Latin rules of accent. Words of two syllables are accented on the first syllable. Examples: *álbus*, *níger*. Words of more than two syllables are accented on the last but one if it is long. Examples: *radícans*, *Myríca*. If the last syllable but one is short, the accent falls on the last but two. Examples: *fríticans*, *líteus*. In pure Latin words a vowel before another vowel, not forming a diphthong, is short. Examples: *líteus*, *áureus*. This does not apply to Greek words [e.g., *gigantéus* derived from γιγάντειος].

"SYLLABLES. If a consonant comes between two vowels, it belongs to the same syllable as the vowel that follows, and the syllable before it is long or short according to the length of the vowel. Where two or more consonants occur together, the first one, as far as accent is concerned, ends a long syllable whether the vowel of that syllable, is by nature, long or short. Examples: *nigréscens*, *palústris*."

The nomenclature adopted appears to be correct in most cases: when in doubt, the author has adopted the name used in Rehder's Manual of Cultivated Trees and Shrubs (1927), but he has apparently not seen the list of Corrections and Emendations issued by Rehder in 1935. *Larix Kaemferi* Sarg. (non Gord.) should be *L. leptolepis* Murr., and *Carya alba* K. Koch (non Nutt.) should be *C. tomentosa* Nutt., these being changes required by the rejection of later homonyms in 1930. *Helianthemum Chamaecistus* Mill. should be *H. nummularium* (L.) Mill. The correct name for the Cedar of Lebanon is *Cedrus libani* Loud., Hort. Brit. ed. 1, 388 (1830), where it was validated by citation of *Pinus Cedrus* L. *Cedrus* had been recognized as a distinct genus in 1757 by Trew (Cedr. Lib. Hist.), who gave diagnostic characters separating it from *Larix*, *Abies* and *Pinus*.

While commending a certain group of botanists for their scrupulous adherence to the International Rules of Botanical Nomenclature, the author himself has set a bad example by declining to follow the Rules as regards priority of specific names, and those concerning the spelling of generic names and specific epithets, where these entail divergence from the etymologically or classically correct form. Had he devoted as much study to botanical nomenclature as he has to philology, we might have been spared the pontifical pronouncement (p. x.) that he was "unable to take seriously Art. 70 of the Rules in so far as this article enjoins the perpetuation of mis-spelling." Examination of the various attempts to reform the spelling of botanical names by St. Lager, Ascherson, Otto Kuntze, Clements and others, shows that the same names have frequently been "corrected" in several different ways by different "experts." For this and other good reasons, successive International Botanical Congresses decided that the original spelling of botanical names must be retained except in cases of typographic or unintentional orthographic error. When Linnaeus named a genus in honour of Gleditsch, he *deliberately* latinized that name in the form *Gleditsia*, because he considered the combination of letters "tsch" an impossible one in Latin. Linnaeus published the name *Pyrus* for a genus of *Icosandria*. To ascribe the generic name *Pirus* to Linnaeus on the ground that the Latin word for a pear tree was *pirus*, not *pyrus*, is a mis-statement of fact, greatly to be deprecated in scientific nomenclature.

The author has failed to give double author-citations where these are required under the type-method, and he has also omitted to give the authorities for generic names. These defects should be remedied in a future edition.

More care might have been taken in correcting the proofs: *Lycium halimifolium* is consistently mis-spelt "*halamifolium*" four times on p. 262, although the derivation from *halimus* is given in a footnote. "*Vaccinium vitis Idaea*" (unhyphenated) occurs three times on p. 235; *Clematis* "*vitalba*" should be *C. Vitalba*, the specific epithet being a former generic name; *Lonicera Periclymenum* appears correctly on p. 275, but as "*periclymenum*" on p. 93. The eponym of *Caesalpinia* is Andrea Cesalpino not Andreas Caesalpini. These and the other points criticized above are, however, but minor blemishes in a very attractive and scholarly book.

T. A. SPRAGUE.

BULLETIN OF MISCELLANEOUS INFORMATION No. 7, 1937 ROYAL BOTANIC GARDENS, KEW

XXXVIII—THE ARBORESCENT *SENECIOS* OF THE CHERANGANI RANGE, WITH SUPPLEMENTARY NOTES ON MT. ELGON SPECIES.

A. D. COTTON and R. A. BLAKELOCK.

In 1932 a paper was published in the Kew Bulletin giving a full account, as far as the facts were then known, of the arborescent *Senecios* of Mt. Elgon. Since that date a large amount of further material from Mt. Elgon has been received at Kew, and an extensive series of specimens collected by Dr. G. Taylor and Mr. P. M. Synge during the British Museum Expedition to East Africa of 1934–35, has enriched the herbarium of the Natural History Museum. From the study of these collections it has been possible to amplify the previous account of the Mt. Elgon species, and to distinguish a remarkable new form of the plant described in 1932 as *S. Gardneri*.

In addition to the material collected on Mt. Elgon, some very interesting collections have been received from a range lying some 50 miles to the east which had not been previously investigated by botanists. The range in question is that of the Cherangani Hills, which were first explored botanically by Mrs. B. P. Powles, and were later visited on four occasions by Mr. I. R. Dale, an Officer in the Kenya Forestry Department.

The industrious collecting on the various East African mountains during the past 5 years has made it clear that, for practical purposes, all the *Senecio* species existing on the main mountain massives have been discovered and that they can be assigned to a fairly definite series of species. There remain, however, several smaller summits and minor ranges which have not been explored, and it is obvious that, before a complete taxonomic account of the tree *Senecios* can be presented, these minor ranges and summits should be investigated.

The following mountains come under this category, the altitudes given being taken from the War Office maps :—

<i>Mountains</i>	<i>Alt. in. ft.</i>	<i>Approximate Position</i>	<i>Notes.</i>
Cherangani Hills ...	10,000-11,500	c. 60 miles E. of Elgon	Tree Senecio present
Moroto	9,666	c.100 " N. "	Tree Senecio absent (<i>vide</i> Eggeling)
Kachagalu ...	9,594	c. 90 " N.N.E. "	Unexplored
Sekerr (Mtelo) ...	10,873	c. 70 " N.E. "	Unexplored
Kadam (Debasien)	9,866-10,016	c. 50 " N. "	Tree Senecio absent (<i>vide</i> Eggeling)
Mau	10,000-11,500	c. 60 " W. of Aberdares	Tree Senecio absent (<i>vide</i> Gardner)
Ngoro-Ngoro ...	10,000-11,500	c.110 " W. of Kilimanjaro	Tree Senecio absent (<i>vide</i> Burt 1932)
Gelei	9,620	c. 90 " W.N.W. of "	Unexplored
Ketumbeine ...	9,620	c. 80 " W. " "	Unexplored
Meru	14,902	c. 40 " W. " "	Tree Senecio present
Hanang	11,125	c.160 " S.W. " "	Tree Senecio absent (<i>vide</i> Burt 1932)

Of the mountains listed material has been received only from Mt. Meru and the Cherangani Hills. Despite suitable altitudes an absence of tree Senecios is reported on Ngoro-Ngoro (Burt *in litt.*). On Loolmalasin (in the eastern massive of the Ngoro-Ngoro) Burt observed "vestiges of former great forests of *Hagenia abyssinica* and *Juniperus procera* which had been ravaged by fires which had swept up from the Masai grazing lands." He suggested that fires may have exterminated a Senecio belt which once crowned the summits, since *Lobelia Burtii* and *Helichrysum Newii* were present in the alpine zone, both of which are often associated with tree Senecios.

As explained in the present paper, specimens from the Cherangani Hills are allied to, but not identical with, the Mount Elgon species, and specimens from Mt. Meru closely resemble, but are not identical with, those found on Kilimanjaro. The study of the species from these outlying areas therefore promises to prove of unusual interest.

On account of the close affinity of the Cherangani species with those of Mt. Elgon, and the proximity of the range to that summit, the collections from both these areas are dealt with together. Treatment of the Mt. Meru species will be postponed until further material has been received.

THE CHERANGANI SPECIES

The only reference to the Cherangani Hills which has been traced in botanical literature is that in Humbert's paper, where Marakwet (Cherangani) is shown in a diagram of the distribution (3). No plants, however, are recorded from the range, and no reference is made to it in the text. The first collector to visit these mountains was Mrs. B. P. Powles of Kitale. She ascended the range in December 1933 and presented a collection of dried plants to Kew, including some specimens of a tree Senecio. This plant bore some resemblance to the two lower species which occur on Mt. Elgon, namely, *S. amblyphyllus* and *S. elgonensis*, but it differed in certain particulars

from both. It has now been fully investigated and is described below as a new species under the name *S. cheranganiensis*.

The Cherangani Hills have since been explored by Mr. I. R. Dale of the Kenya Forest Department, who paid a visit there in March 1934 and also in September 1934, January 1935 and June 1935, and from him a further series of specimens of the same species were obtained and also another and dwarfer species which Mr. Dale stated was distinct. His view as to this has been confirmed and the plant is dealt with below as a new species under the name *S. Dalei*.

Before describing these plants it may be interesting to give an account of the Cherangani Range, based on notes furnished by Mr. Dale.—“The so-called Cherangani Hills are situated in the west of Kenya, roughly 60 miles east of Mt. Elgon. Except for a small ‘white’ area of farmland on the west the hills are occupied by three tribes, the Cherangani on the west, the West Suk in the north, and the Marakwet in the remainder, which is by far the largest area.

“The hills, which are approximately 40 miles long, rise to the north east of the Uasin Basin plateau and spread out in a half open fan-shaped manner. To the observer on the ground the hills appear to be in parallel ridges. The highest peaks are over 11,000 ft. To the west the hills are bounded by the Trans-Nzoia and Moiben districts (about 6500 ft.). In the north the hills have a bastion formation and the land drops steeply to the West Suk plains (about 5000 ft.). In the east the land drops almost precipitously to the Kerio Valley (part of the Eastern Rift Valley) with an altitude of 4000 ft. and less. No rainfall measurements have ever been made on top of these hills but the fall is probably between 60 and 80 inches a year. The hills are very important owing to the numerous streams which rise thereon.

“The rocks, largely pegmatites, are much older than those of Mt. Elgon. Quartz outcrops are common, and a fair proportion of the hills have a thin layer of grass-covered soil overlying quartz. Northwards above 8500 ft. the forest changes into one dominated by Cedar (*Juniperus procera*). *Pittosporum abyssinicum*, *Cornus Volkensii*, *Hagenia abyssinica* and bamboo (*Arundinaria alpina*) are also present. Above 9500 ft. bamboo is usually dominant with occasional trees, the commonest of which is *Hagenia*. Steep, rocky eroded hillsides, 7000 to 9000 ft., usually support *Protea abyssinica*, *Lasiosiphon glaucus*, and *Faurea saligna* (and occasional plants of *F. speciosa* at 7500 ft.).

“About a third of the hills are grassland and are used for pasturing cattle and sheep. Below 9500 ft. in these areas the valleys are filled with forest, but at higher altitudes the forest becomes a mere fringe and eventually ceases. Above 10,000 ft. the open land bears moorland species, e.g., *Erica arborea*, *Stoebe kilimandscharica*, and *Philippia Johnstoni*.

"As far as I am aware the 'tree' *Senecios* only occur in the northern half of the hills. The tall species, *S. cheranganiensis*, has a range of 8500 to 10,500 ft. In the north and north-west I have seen it along stream banks at 8500 ft., but it is not common. I have not seen it in swamps at this altitude. From 9000 to 10,000 ft. it occurs along streams or in swamps. Above 10,000 ft. the tree only grows in wet but well-drained situations, i.e., along streams, around springs and at swamp edges. Definite forests of *Senecio* such as occur on Ruwenzori are not found.

"The dwarf species —*Senecio Dalei*—occurs in swamps above 10,000 ft. and only, as far as I am aware, in the north-east of the hills. The flora of these is, except for the *Senecio*, entirely herbaceous and is largely composed of *Helichrysum* spp., *Alchemilla* spp. and *Lobelia aberdaricus*."

The following is a description of the two species referred to above, and, as will be seen from the remarks following *S. cheranganiensis*, it is possible that a third species is present on the range.

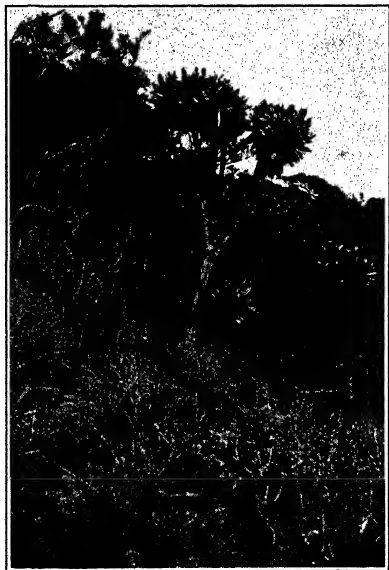
***Senecio cheranganiensis* Cotton et Blakelock, sp. nov.;** a *S. amblyphylo* Cotton foliis angustioribus, lamina in petiolum sensim abeunte, disci floribus paucioribus differt.

Arbor usque 9 m. alta. *Truncus* crassus, angulo acuto (c. 30°) semel vel bis ramosus, raro infra 2·5 m. ramosus, foliis marcescentibus vestitus. *Folia* tenuia vel subcrassa, lanceolata vel anguste lanceolata, apice acuta vel obtusa, dentata vel apice integra, lamina basi in petiolum sensim attenuata; lamina 24·5–47 cm. longa, 7–13 cm. lata, supra glabra, infra crispato-pilosa vel glabra, costa praecipue basin versus pilosa demum glabrescente, nervis lateralibus angulo acuto vel fere 90° ortis 1·5–2·5 cm. inter se distantibus; petiolus alatus, margine integro, 14–17 cm. longus, angustissima parte 1·5–2·5 cm. latus, supra basin longe pilosus. In plantis juvenilibus folia oblongo-elliptica, obtusa, usque 20·5 cm. longa, 6·5 cm. lata, infra glabra, costa pilosa vel glabrescente; petiolus haud alatus, pilosus vel glabrescens, 18 cm. longus, 3 mm. latus. *Inflorescentia* c. 1 m. alta, bracteata, paniculata; axis ramulique lanati; bracteae foliosae, supra glabrescentes, infra sparse pubescentes vel glabrae, basi late alatae. *Capitula* subcampanulata, 1–1·5 cm. longa, 1·5–2 cm. lata (ligulis excl.). *Involucri bracteae* 3-seriatae: exteriores 8–12, lineares, ciliatae, circiter 12·5 mm. longae, 1 mm. latae; interiores 10–13, 2-seriatae, anguste lanceolatae, acutissimae, 13–15 mm. longae, 2–4 mm. latae, virides. *Flores radii* 10–13, longe ligulati, flavi; ligula 1·5–1·8 cm. longa, 3–4 mm. lata, tubo 6 mm. longo. *Flores disci* 35–46, tubo 8–9 mm. longo.

KENYA COLONY. Cherangani Hills. 9300–9500 ft., Dec. 1933, Mrs. B. P. Powles 37, 39, 40, 41, 43, 44, 45, 46, 47; source of Moyben River, 9000–9500 ft., March 1934, I. R. Dale 3210; near Pope's Nose, 8500 ft., January 1935, I. R. Dale 3392 (type); young plant, Kaisungal, 9200 ft., April 1935, I. R. Dale 3399. Wet situations from 8500–10,500 ft. in the northern half of the Hills, growing



Senecio Dalei at 10,000 ft., with *Lobelia aberdarica* in background.



Two plants of *Senecio cheranganiensis*. Man in between holding dead plant of *S. Dalei* (twice branched).

Senecio cheranganiensis, with *S. Dalei* in flower on the right (held up by man).

Photos: I. R. Dale.

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in small patches in the open or in forest glades, where it reaches its greatest size (Powles, Dale).

S. cheranganiensis (Plate XVI) is most nearly allied to *S. amblyphyllus* Cotton, of Mount Elgon, but it is distinct from this species in the narrower leaf with long attenuated base and lack of demarcation between lamina and petiole (fig. 1), and also in the smaller number of disc florets. In *S. amblyphyllus* the base of the leaf is cordate and there is a very distinct petiole. The new species differs from *S. elgonensis* Th. Fries most markedly in the much thinner texture of the leaf and to a less extent in its form.

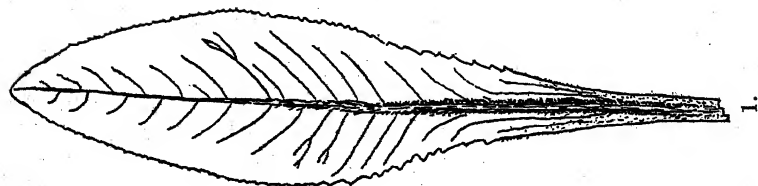
Mrs. Powles' gathering included a young plant showing pilose leaves. In these specimens the petiole was long, more or less distinct and unwinged. This juvenile condition does not apparently last long, as in a plant about a foot high collected by Mr. Dale (No. 3399) the leaves have a broadly winged petiole as in the adult form.

It should be added that another gathering from the Cherangani Hills represents a form intermediate between *S. amblyphyllus* and *S. cheranganiensis*. This specimen (Dale 3240) shows a wider leaf with an obtuse or rotundate apex similar to *S. amblyphyllus*, and differs from that species only in possessing a lamina merging into the petiole (figs. 2 and 4). The younger leaves of this same gathering resemble those of *S. cheranganiensis*. This plant is probably a variant of *S. cheranganiensis* but until more material is available it appears inadvisable to include it under that species or to adjust the description to cover it.

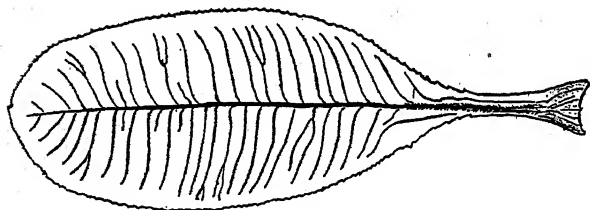
Notwithstanding the existence of this intermediate specimen, the occurrence of so many gatherings showing the consistently narrow leaf and the decurrent lamina (characters in strong contrast to those obtaining in *S. amblyphyllus*) appears to provide sufficient reason for describing the dominant Cherangani plant as a distinct species. It certainly cannot be satisfactorily referred to either of the two lower Mt. Elgon species as at present understood.

Senecio Dalei Cotton et Blakelock, sp. nov. ; a *S. cheranganiensis* differt habitu nano, foliis crassioribus hirsutioribus minoribus, petiolo latiore, bracteis latioribus saepe acuminatis, floribus disci pluribus.

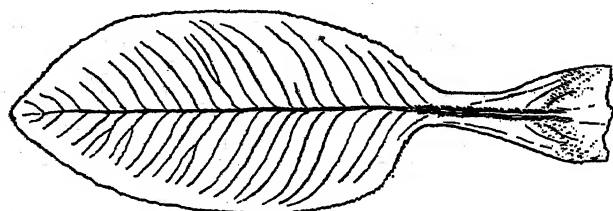
Planta c. 1 m. alta (inflorescentia excl.). *Truncus* lignosus, angulo obtuso (c. 50°) semel vel bis ramosus. *Folia* crassa, lanceolata, apice acuta vel rotundata, dentata, lamina in petiolum sensim attenuata ; lamina 17–28 cm. longa, 8–12 cm. lata, supra parce pilosa deinde glabra, infra dense pilosa demum glabrescens, costa barbato-tomentosa demum (praecipue apicem versus) glabrescente, nervis lateralibus a costa angulo acuto (c. 40°) ortis distinctis 1.5–2 cm. inter se distantibus ; petiolus late alatus, margine integro, 7–21 cm. longus, angustissima parte 2.2–3.5 cm. latus, infra pilosolanatus laminam versus, basin versus glaber, supra basin dense longaeque pilosus. In plantis juvenilibus folia ut in adultis. *Inflorescentia* orbiculata, c. 60 cm. alta, bracteata, paniculata ; axis



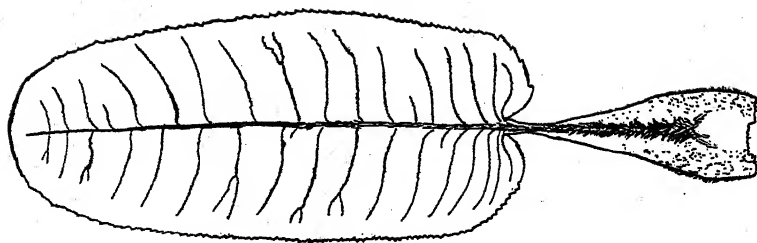
1.



2.



3.



4.

Fig. 2. Intermediate form (Dale 3240).

Fig. 4. *S. amblyphyllus*.

Fig. 1. *Senecio cheranganiensis*.

Fig. 3. *S. elgonensis*.

ramulique lanati; bracteae foliosae, supra sparse pilosae, infra pilosae, basi late alatae. *Capitula* turbinata, pendula, longe pedunculata, 1.3-1.5 cm. longa, 1.5-2 cm. lata (ligulis excl.). *Involucri bracteae* 3-seriatae; exteriores 12-14, lineares, 7-13 mm. longae, 1 mm. latae, margine ciliatae; interiores 2-seriatae, c. 13, lanceolatae vel oblongae, apice acuminatae vel acutae, 11-13 mm. longae, 3-6 mm. latae, virides, apicem versus purpurascentes. *Flores radii* 12-13, longe ligulati, flavi; ligulae 1.5-1.8 mm. longae, 3-4 mm. latae, tubo 6-7 mm. longo. *Flores disci* 53-67, 8-9 mm. longi. *Achaenia* immatura glabra, 7-8-striata.

KENYA COLONY. Cherangani Hills. 10,000 ft., Sept. 1934, I. R. Dale 3239; 10,000 ft., June 1935, I. R. Dale 3393 (type), 3394, 3398. In north-east part only, in swamps above 10,000 ft.

This species according to Mr. Dale is a dwarf plant not exceeding 3 ft. in height (Plate XVI) and is therefore of great interest as representing a species approximating in habit to the two species of the "cabbage" type (i.e., *S. Brassica* and *S. brassiciformis*). The leaves resemble in tomentum and venation those of *S. cheranganiensis* and not those of the cabbage type to which it is probably not closely related. The plant is principally distinguished from *S. cheranganiensis* by its dwarf habit, by its angle of branching and by the young leaves being more densely pilose below and possessing a slightly wider petiole. The inner involucre bracts, moreover, are wider and somewhat acuminate.

Mr. Dale gives the following statement with regard to the two Cherangani species:—" *S. Dalei* is a much shorter plant, but the most notable difference is the manner of branching. *S. cheranganiensis* often delays branching until it is 12 feet high, the branching is always acute, i.e. at about 30°, branching taking place to the third and possibly fourth degrees. Branching in *S. Dalei* may occur at 1 ft. from the ground, and the angle is obtuse, being about 50°. Branching occurs only once or twice. When *S. cheranganiensis* is growing in ill-drained swamps, growth is retarded and very occasionally specimens may branch at 4 feet but the angle of branching remains acute. The leaves of *S. Dalei* are smaller than those of *S. cheranganiensis*, and the habit of the rosette is much denser. As seen in the field the capitula of *S. Dalei* tend to be larger."

Mr. Dale notes that *S. Dalei* was in full bloom in June 1935, at which date no flowering specimen of *S. cheranganiensis* were seen. The leaves of the young plants (Dale 3394, 3398) do not differ in shape, petiole characters or type of indumentum from those of the mature plant.

THE MOUNT ELGON SPECIES

S. elgonensis *Th. Fries f.* This species has hitherto been collected well above the forest level, usually between 11,000 and 13,000 ft. Mr. Synge has, however, observed trees as low as 10,000 ft., just within the upper limits of the heath belt (Synge 887).

These specimens were of interest in showing slight modifications which occur when the species grows in semi-shade. They possessed a more lanky habit and had less marcescent foliage, and the leaves though typical in outline were quite as thin as those of *S. amblyphyllus*. In the other direction it is now known that occasional specimens are found higher than was formerly thought. Mr. Dale, indeed, identified a plant (No. 3142) at the summit of Kumukoi, namely, at 14,000 ft. The extreme range of *S. elgonensis* as at present known is from 10,000–13,200 ft. on the Uganda side of Mt. Elgon and from 10,500–14,000 ft. on the Kenya side.

The description of the leaf (fig. 3) of *S. elgonensis* given in the Kew Bulletin (1932, 470), and also the geographical distribution, may now be enlarged and emended as follows:—Leaf thick and coriaceous to fairly thick, thin if grown in semi-shade; apex acute, subacute or rounded; lateral veins arising usually at an acute angle rarely at an obtuse angle. Petiole fairly broadly winged, 10–18 cm. long, 2–5 cm. wide in narrowest part towards insertion, base wider 4–10 cm. wide; midrib pilose or piloso-lanate on both surfaces; wings pilose or becoming glabrous except towards the base on both surfaces. Disc florets 60–90.

KENYA COLONY. Mt. Elgon. 12,000 ft., Dec. 1930, *E. J. and Mrs. C. Lugard* 437; 13,000 ft., Nov. 1931, *Capt. and Mrs. C. Lugard* 696; 11,000 ft., Feb. 1932, 699; 11,000 ft., Feb. 1932, *Tweedie* 113 (Nairobi Herb.); 10,500 ft., June (?) 1932, *Porter* 2732; 14,000 ft., July 1933, *Dale* 3142; 13,200 ft., Feb. 1935, *G. Taylor* 3768; 13,000 ft., Feb. 1935, 3720a; 11,400 ft., Feb. 1935, 3759; 11,500 ft., March 1935, 3835a.

UGANDA PROTECTORATE. Mt. Elgon. Jan. 1918, *Dummer* 3382 (type); 1913, *Kmunko* (Mus. Vind.); Oct. 1916, *Snowden* 480; 11,500 ft., April 1930, *Liebenberg* 1609; 12,800 ft., Sept. 1932, *Thomas* 628, 630; 10,000–10,500 ft., Aug. 1934, *Synge* 887; 10,500 ft., Aug. 1934, 888; 11,000–13,000 ft., Aug. 1934, 921; 10,500 ft., 10,600 ft., May 1935, 1887, 1886.

***S. amblyphyllus* Cotton.** This was described in 1932 from a single gathering. Now that further material has been received a fuller statement can be made as to the altitudinal range and the description can be amplified and amended. It is found that the species is not confined to the fringe of the forest as was thought, but that at times it occurs in the open. The leaves were distinguished from those of *S. elgonensis* by the much thinner texture, more oblong outline and blunt apex, and to a lesser extent by the venation. Although the leaf is constantly thin and much thinner than that of typical *S. elgonensis*, examination of the wealth of new specimens shows that there is no constant difference in leaf apex or venation, and that, as explained above, specimens of *S. elgonensis* from the forest fringe may possess leaves as thin as those of *S. amblyphyllus*. The cordate leaf base and the petiole narrowed at the insertion appear to be constant characters and to provide a ready means of

distinction between the two species. Thus, though the lowermost forms of *S. elgonensis* resemble certain forms of *S. amblyphyllus*, there still appears good ground for retaining the two plants as distinct species (fig. 4).

S. amblyphyllus is known to occur on the Uganda side of Mt. Elgon:—in marshy places in the bamboo forest (Thomas 655, Synge 853, 1081), and on the Kenya side:—in the heather forest zone (Dale 3211), and along stream sides above the forest limit up to 11,500 ft. (Taylor 3760, 3786, 3835). The leaf in the individuals growing at the higher altitudes is somewhat thicker than that of the forest forms but not so thick as in typical specimens of *S. elgonensis*. Mr. Synge states that it prefers open places in the forest and does not tolerate a great degree of shade.

A revised description of *S. amblyphyllus* is appended.

Tree up to about 8 m. high. Trunk woody, branched, covered above by marcescent foliage, branched at 5–18 ft. Leaf thin to fairly thick, oblong or oblong-elliptical, dentate, apex acute to rotundate, lamina cordate at base, petiole and midrib sometimes tinged with red or purple; lamina 30–40 cm. long, 12–20 cm. wide, pilose above when young, glabrous when mature, below shortly and sparsely pilose, midrib arachnoid-tomentose pilose towards base glabrescent towards apex; lateral nerves usually arising at an obtuse angle (often nearly a right angle); petiole narrow-winged near lamina broader towards base, 17–27 cm. long, 0.5–1.3 cm. wide at the narrowest part, 4–7 cm. wide at base, midrib pilose or pilose-lanate above and below, wings pilose below, glabrescent or pilose above, above at base of petiole long and densely pilose. In young plants leaves oblong-elliptical, dentate, apex obtuse, lamina pilose above and below, 18 cm. long, 8 cm. wide; petiole unwinged, cylindrical, clothed with long dense hairs, 6.5 cm. long. Inflorescence about 1 m. high; main axis and branches lanate; leafy bracts oblong to elliptical with a broadly winged base, sparsely pilose below, sparsely pilose or glabrescent above. Flower heads subturbinate, c. 1.2–1.5 cm. long, c. 1.5–2 cm. wide (excl. rays). Involucral bracts 3-seriate; outer 8–10, linear, lanate at margin, 6–10 mm. long, 1 mm. wide; inner bracts 2-seriate, 13–15, narrowly lanceolate, acute, green, glabrous or glabrescent, 12–15 mm. long, 2–5 mm. wide. Ray flowers 10–14, long-ligulate, yellow; ligule 14–20 mm. long, 3–4 mm. wide, tube 5–6 mm. long. Disc flowers 55–65, corolla 9–10 mm. long. Achenes striate, glabrous.

KENYA COLONY. Mt. Elgon. Feb. (?) 1931, Fairbairn 2678 (type); 11,500 ft., Nov. 1932, Tweedie 14; 10,500 ft., Jan. 1934, Dale 3211; 11,500, 11,400, 11,200, 11,200 ft., Feb.–March 1935, G. Taylor 3835, 3760, 3785, 3786.

UGANDA PROTECTORATE. Mt. Elgon. 9100 ft., Sept. 1932, Thomas 655; 9500 ft., Nov. 1933, Tothill 2318; 9500 ft., Aug. 1934, Synge 853; c. 10,000 ft., Sept. 1934, Synge 1081.

S. Gardneri var. **ligulatus**, var. nov. A typo floribus radii ligulatis differt. *Habitus, folia, et inflorescentia* ut in *S. Gardneri*. *Involucri bracteae* 3-seriatae; extimae 11, lineares, purpureae, lanatae (margine praecipue), 10–13 mm. longae, 1 mm. latae; interiores 2-seriatae, purpureae, glabrescentes, lanceolatae, apice acutae, 14–15 mm. longae, 3–5 mm. latae. *Flores radii* 10, breviter ligulati, flavi; ligula recurva, 4–5-nervi, 3–6-dentata, 5–6 mm. longa, 4 mm. lata; tubus 6–8 mm. longus, leviter campanulatus; staminodia 5, libera, 4 mm. longa. *Flores disci* c. 70, tubo 10 mm. longo, dentibus 1 mm. longo; antherae 1 mm. exsertae. *Ovaria* striata, glabra, 3 mm. longa; pappus 7–8 mm. longus.

KENYA COLONY. Mt. Elgon. Feb. 1935, 13,800 ft., *G. Taylor* 3719.

Except for the presence of conspicuous ligulate florets this remarkable plant agrees with *S. Gardneri*, and is therefore described as a variety of that species. It was discovered by Dr. G. Taylor during the British Museum Expedition to East Africa, and was the only ligulate specimen observed among many hundreds of growing plants examined by him. No trace of such variation in *S. Gardneri* has been recorded by previous collectors nor is even a tendency in that direction exhibited by any of the specimens in herbaria. The discoid florets were somewhat fewer than in normal *S. Gardneri*, but this is regarded as a casual variation.

There are three possible explanations for the occasional presence of ligulate florets in a species such as this which is normally homogamous: (a) that, assuming the radiate flower to be primitive for the genus (as Hutchinson and others hold) and the homogamous flowers to be specialised for the conditions at high altitudes, the ligulate flower-heads represent the survival of a primitive character; (b) that they arise as a gene mutation and (c) that the ligulate form is a hybrid between the normal plant and a ligulate species, in this case *S. elgonensis* Th. Fries which occurs with *S. Gardneri*.

The ligulate character is known to vary in several genera of *Compositae* but only one example appears to have been genetically studied, namely that of *Senecio vulgaris* L. In this Trow showed that the radiate character bred true and could be transferred to non-radiate forms by hybridization. Hybrid forms with ligules smaller than the normal were produced showing that neither factor was completely dominant (1).

In connection with the above discovery it may be noted that Hauman (4) refers to *S. Friesiorum* Mildbr., another homogamous species, as generally possessing only discoid capitula but occasionally producing ray florets with ligules only 3–4 mm. long and hidden by the involucre bracts. This has been confirmed at Kew, two specimens (*Humbert* 8934, *Hauman* 469) showing on dissection florets with very short rays and possessing staminodes. They also exhibit a type of corolla intermediate between the ligulate and tubular form. Intermediate florets of this nature have also been found in

the heterogamous species *S. adnivalis*, the small ray florets possessing staminodes in certain specimens.

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XXXIX—CONTRIBUTIONS TO THE FLORA OF SIAM: ADDITAMENTUM XLIV.

Planchonella Kerrii Fletcher [Sapotaceae-Sideroxylinae]; *P. obovatae* (R. Br.) H. J. Lam affinis sed nervis lateralibus paucioribus, petiolis longioribus, inflorescentiis aureo- (nec ferrugineo-) tomentosis, filamentis antherisque subaequalibus differt.

Arbor circiter 30 m. alta (ex Kerr); ramuli parum crassi, teretes, primo pilosi mox glabri, cortice cinereo obtecti. *Folia* elliptica vel obovata, apice late obtusa, basi decurrentia, 15–20 cm. longa, 8–10 cm. lata, chartacea, supra brunnea viridi-tincta, subtus pallidiora, utrinque nitida, supra glabra, subtus ad costam primo pubescentia, mox glabra, costa supra conspicua subtus prominente, nervis lateralibus 8–10-paribus subtus valde prominulis angulo 50° e costa adscendentibus intra marginem arcuatis, nervis transversis numerosis parallelis, margine integra, petiolo 4 cm. longo glabro suffulta. *Inflorescentiae* in axillis foliorum vel praesertim eorum cicatricum positae, 4–10-florae; pedicelli 1.5–3 mm. longi, apice incrassati, aureo-tomentosi. *Sepala* late ovata vel rotundata, 2.5–3 mm. longa, extra sericeo-tomentosa, ciliata. *Corolla* 4–4.5 mm. longa, glabra; tubus 3 mm. longus; lobi 1.5–2 mm. longi, 1–1.5 mm. lati, apice truncati. *Stamina* 1.5 mm. longa, filamentis crassis 0.75 mm. longis, antheris sagittatis obtusis; staminodia lanceolata 1 mm. longa. *Ovarium* globosum, aureo-pilosum, 2.5 mm. diametro; stylus 2 mm. longus, glaber.

Krabi, Ao Luk, c. 100 m., evergreen on limestone hill, Kerr 19372.

Planchonella lenticellata Fletcher [Sapotaceae-Sideroxylinae]; *P. burmanicae* (Coll. et Hemsl.) H. J. Lam affinis sed fructibus magis acuminatis, foliis coriaceis, nervis lateralibus paucioribus, nervulis

supra impressis subtus obscuris differt; nec non *P. assamicae* (C. B. Clarke) Fletcher* affinis sed foliis minoribus glabris pedicellis adpresse griseo-pubescentibus nec rubro-villosis differt.

Arbor circiter 5 m. alta (ex *Kerr*); ramuli obtuse quadrangulares, glabri, brunnei, rugosi, lenticellis numerosis et conspicue elevatis praediti. *Folia* elliptica, apice late obtusa vel rotundata, basi cuneata, 5–10 cm. longa, 2.5–5 cm. lata, coriacea, utrinque brunnea glabra, costa supra conspicua subtus prominente, nervis lateralibus 10–12-paribus, supra subconspicuis, subtus prominulis parallelis angulo 70° e costa adscendentibus intra marginem arcuatim junctis, nervulis supra firme impressis subtus obscuris, margine integra leviter recurva, petiolo circa 5 mm. longo glabro rugoso suffulta. *Inflorescentiae* in axillis foliorum vel praesertim eorum cicatricum positae, 1–2-florae; pedicelli 4 mm. longi, adpresse pubescentes. *Sepala* ovata, 5 mm. longa, 3–4 mm. lata, crassa, leviter carinata, apice rotundata, intus et extra sericeo-pubescentia. *Corolla* circiter 7 mm. longa, glabra; tubus 2–2.5 mm. longus; lobi 4.5–5 mm. longi, 2.5 mm. lati, elliptici, apice rotundati. *Stamina* 4 mm. longa, filamentis 1 mm. longis, antheris sagittatis acuminatis; staminodia late elliptica vel subrotundata, valde carinata, margine conspicue fimbriata, apice longe aristata. *Ovarium* ovoideum, 2 mm. diametro, aureo-pilosum; stylus 8 mm. longus, glaber. *Fructus* ovatus, 3–3.5 cm. longus, 1.5–2 cm. latus, sparse adpresse pubescens vel glaber, 1–2-spermus.

Dio Chiengdao, c. 1300 m., open evergreen forest, *Kerr* 5335.

***Planchonella punctata* Fletcher** [Sapotaceae-Sideroxylinae]; *P. burmanicae* (Coll. et Hemsl.) H. J. Lam affinis sed foliis subtus minute punctatis recedit.

Arbor circiter 20 m. alta (ex *Kerr*); ramuli teretes vel obtuse quadrangulares, glabri, brunnei, rugosi, lenticellis numerosis et conspicue elevatis praediti. *Folia* elliptica, apice obtusa, basi cuneata, 8–15 cm. longa, 4–6.5 cm. lata, chartaceo-coriacea, utrinque brunnea glabra, subtus minute punctata, costa supra subconspicua subtus prominente, nervis lateralibus circa 10-paribus supra subconspicuis vel leviter impressis subtus prominulis parallelis angulo 55° e costa adscendentibus intra marginem arcuatim junctis, nervulis numerosis utrinque interdum obscuris, margine integra leviter recurva, petiolo circiter 10–15 mm. longo glabro supra complanato suffulta. *Inflorescentiae* imperfectae, in foliorum cicatricum axillis positae; pedicelli circiter 7 mm. longi, adpresse pubescentes. *Sepala* ovata vel oblongo-ovata, 6 mm. longa, 3–4 mm. lata, crassa, leviter carinata, apice acuta vel obtusa, intus et extra sericeo-pubescentia. *Corolla* 8 mm. longa, glabra; tubus 2.5–3 mm. longus; lobi 5–5.5 mm. longi, oblongo-elliptici, apice rotundati vel late obtusi. *Stamina* 4 mm. longa, filamentis 2.5 mm. longis,

* ***Planchonella assamica* (C. B. Clarke) Fletcher**, comb. nov.—*Sideroxylon assamicum* C. B. Clarke in Hook. fil. Fl. Brit. Ind. 3, 537 (1882).

antheris sagittatis acuminatis; staminodia ovata, apice aristata, 5 mm. longa (arista inclusa), valde carinata. *Ovarium* conicum, 2 mm. latum, aureo-pilosum; stylus 10 mm. longus.

Chiengmai, Samông, c. 600 m., mixed deciduous forest, *Kerr* 6392.

Planchonella sericea *Fletcher* [Sapotaceae-Sideroxylinae]; *P. obovatae* (R. Br.) H. J. Lam affinis sed foliis magis obovatis apice obtuso-acuminatis subtus cinereo-sericeis, pedicellis aureo-sericeis nec ferrugineo-tomentosis differt.

Arbor circa 25 m. alta (ex *Kerr*); ramuli crassi, obtuse quadrangulares vel teretes, primo ferrugineo-pubescentes mox glabrescentes, cortice cinereo vel cinereo-brunneo obtecti. *Folia* obovata, apice obtuse acuminata, basi valde attenuata, in petiolum decurrentia, 10–15 cm. longa, 5–8 cm. lata, coriacea, supra brunnea subtus pallidiora, utrinque sericeo-pubescentia atque nitida, costa supra impressa subtus prominente, nervis lateralibus 10–12-paribus supra conspicuis subtus prominulis parallelis, angulo 50°–55° e costa adscendentibus intra marginem arcuatim junctis, nervis transversis irregularibus utrinque conspicuis, margine integra, petiolo 2–3 cm. longo supra canaliculato sericeo-pubescente suffulta. *Inflorescentiae* in axillis foliorum vel praesertim eorum cicatricum positae, 4–8-florae; pedicelli circiter 5 mm. longi, striati, aureo-sericei, apice incrassati. *Flores* immaturi, alabastra elliptica, 2 mm. longa.

Pang-nga, Kao Katakwan, c. 100 m., evergreen forest, *Kerr* 18503.

In spite of the specimen being in flower-bud only, it is from foliage characters a very distinct species. The leaves are broadly obovate, strongly tapering at the base, obtusely acuminate at the apex and at first markedly sericeous on both surfaces but later only so below.

Planchonella siamensis *Fletcher* [Sapotaceae-Sideroxylinae]; *P. maritimae* Pierre affinis, sed ramulis espinosis, foliis ellipticis nec obovatis differt.

Arbor circiter 12 m. alta (ex *Kerr*); ramuli teretes vel obtuse quadrangulares, glabri, cortice cinereo-brunneo obtecti. *Folia* elliptica, apice rotundata saepe apiculata, basi valde attenuata, in petiolum decurrentia, 4–5 cm. longa, 1–2 cm. lata, coriacea, utrinque brunnea, glabra, supra nitida, costa supra leviter impressa subtus valde prominente, nervis lateralibus 5–7-paribus supra conspicuis subtus subprominulis parallelis angulo 45° e costa adscendentibus, intra marginem arcuatim junctis, nervulis paucis irregularibus inconspicuis, margine integra leviter recurva, petiolo 3 mm. longo glabro suffulta. *Inflorescentiae* in axillis foliorum vel praesertim eorum cicatricum positae, 2–4-florae; pedicelli 3–4 mm. longi, griseo-tomentosi. *Sepala* ovata, apice rotundata, 3–4 mm. longa, 2 mm. lata, intus et extra griseo-tomentosa. *Corolla* alba (ex

Kerr), 4.5–5 mm. longa; tubus 1.5 mm. longus; lobi lanceolati, 3–3.5 mm. longi, 1 mm. lati, apice rotundati. *Stamina* 4 mm. longa, filamentis 2.5 mm. longis, antheris sagittatis apiculatis; staminodia lanceolata, 1 mm. lata, 3 mm. longa. *Ovarium* globosum, aureo-pilosum, 2 mm. diametro; stylus 4 mm. longus, glaber.

Kanburi, c. 50 m., open scrub, *Kerr* 10124.

***Palaquium Garrettii* Fletcher** [Sapotaceae-Palaquiinae]; species *P. koratensi* Fletcher affinis, sed floribus paulo minoribus, staminibus numerosioribus, filamentis antherisque minoribus differt; nec non *P. obovato* Engler affinis sed ovario sericeo-pubescente differt.

Arbor circiter 18 m. alta (ex *Garrett*); ramuli crassi, cicatricibus per multis foliorum inflorescentiarumque tecti primo adpresse puberuli, mox glabrescentes, cortice brunneo obtecti. *Folia* ad ramulorum apices dispersa (ex *Garrett*), elliptica vel oblonga vel oblongo-lanceolata, apice rotundata vel late obtusa, basi cuneata, 10–20 cm. longa, 3.5–8 cm. lata, chartacea, utrinque brunnea, subtus pallidiora, glabra, costa supra leviter impressa subtus prominente, nervis lateralibus 12–16-paribus supra subconspicuis subtus prominulis angulo 45–60° e costa excurrentibus intra marginem arcuatis, nervis transversis numerosis irregularibus, margine integra, petiolo 1.5–2.5 cm. longo adpresse puberulo suffulta. *Inflorescentiae* 3–6-florae, in axillis foliorum cicatricum positae; pedicelli crassi, aureo-sericeo-pubescentes, 1.5–2 cm. longi. *Calyx* extra aureo-sericeo-pubescent, intus glaber; lobi 3 exteriores late ovati vel deltoidei, 3.5 mm. longi, 3 mm. lati, apice obtusi, 3 interiores late ovati vel subrotundati, 3.5–4 mm. longi, 3–3.5 mm. lati, leviter carinati, valde ciliati, apice rotundati. *Corolla* alba (ex *Garrett*), extra glabra; tubus 3 mm. longus; petala 6, ovata vel elliptica, 7 mm. longa, 4 mm. lata, ciliolata, apice rotundata. *Stamina* 18–20, fauce inserta; filamenta crassa, 2–3 mm. longa; antherae 3 mm. longae, apice acutae. *Ovarium* aureo-sericeo-pubescent, circa 1.5 mm. diametro, 6-loculatum; stylus basi adpresse pubescens, crassus, 10 mm. longus.

Chiengmai, Doi Pa Kao, East slope near Me Nya, c. 1055 m., *Garrett* 113.

***Palaquium koratense* Fletcher** [Sapotaceae-Palaquiinae]; species *P. obovato* Engler affinis, sed ovario sericeo-pubescente nec glabro, stylo minore differt.

Arbor circiter 20 m. alta (ex *Kerr*); ramuli crassi, cicatricibus per multis foliorum inflorescentiarumque tecti primo adpresse puberuli, mox glabrescentes, cortice brunneo obtecti. *Folia* ad ramulorum apices dispersa, oblanceolata vel oblongo-oblanceolata, apice rotundata vel late obtusa, basi cuneata, 10–18 cm. longa, 3–6 cm. lata, coriaceo-chartacea, supra griseo-brunnea viridi-tincta, subtus brunnea, utrinque glabra, costa supra impressa subtus valde prominente, nervis lateralibus 12–16-paribus supra subconspicuis subtus prominulis angulo 70–80° e costa excurrentibus intra marginem

arcuatis, nervis transversis numerosis plus minusve parallelis, margine integra leviter recurva, petiolo 1–2 cm. longo supra valde canaliculato adpresse puberulo suffulta. *Inflorescentiae* 2-florae, in axillis foliorum cicatricum positae; pedicelli 2 cm. longi, aureo-sericeo-pubescentes, apice incrassati. *Calyx* extra aureo-sericeo-pubescent, intus glaber vel sparse puberulus; lobi 3 exteriores late ovati vel deltoidei, 3–3.5 mm. longi, 4 mm. lati, apice obtusi, ciliolati, 3 interiores late ovati 4 mm. longi, 4–4.5 mm. lati, carinati, ciliati, apice obtusi vel subrotundati. *Corolla* alba (ex *Kerr*), extra glabra; tubus crassus, cylindricus, 3.5–4 mm. longus; lobi 6, ovati vel elliptici, 8 mm. longi, 4 mm. lati, ciliolati, apice truncati. *Stamina* 12–14, fauce inserta; filamenta 3–4 mm. longa; antherae 4.5–5 mm. longae, apice acutae. *Ovarium* aureo-sericeo-pubescent, circa 1.5 mm. diametro, 6-loculatum; stylus crassus, 7–10 mm. longus.

Korat, Lao Lem, c. 900 m., evergreen forest, *Kerr* 9966.

***Palaquium punctatum* Fletcher** [Sapotaceae-Palaquiinae]; species *P. obovato* Engler affinis, sed foliis subtus punctatis recedit.

Arbor circiter 20 m. alta (ex *Kerr*); ramuli crassi, cicatricibus permultis foliorum inflorescentiarumque tecti, primo adpresse ferrugineo-puberuli mox glabri, cortice brunneo vel cinereo-brunneo obtecti. *Folia* ad ramulorum apices dispersa, oblanceolata vel oblongo-oblanceolata, apice rotundata vel late obtusa, basi attenuata, 12–15 cm. longa, 4–6 cm. lata, coriacea, supra brunnea viridi-tincta, subtus cinerea, utrinque glabra, subtus minute punctata, costa supra impressa subtus valde prominente, nervis lateralibus 10–12-paribus supra subconspicuis subtus prominulis angulo 45° e costa excurrentibus intra marginem arcuatis, nervis transversis paucis irregularibus, margine integra leviter recurva, petiolo circa 2 cm. longo supra canaliculato puberulo vel glabro suffulta. *Inflorescentiae* 4–6-florae, in axillis foliorum cicatricum positae; pedicelli circiter 10 mm. longi, striati, ferrugineo-puberuli, apice incrassati. *Flores* immaturi; alabastri rotundati 3–4 mm. diametro.

Kaw Tao, c. 100 m., evergreen forest, *Kerr* 16028.

Although the specimen is in flower-bud only, its punctate leaves make it a very distinct plant.

***Madhuca esculenta* Fletcher** [Sapotaceae-Palaquiinae]; species *M. neriifoliae* (Moon) H. J. Lam affinis, sed foliis angustioribus, nervis lateralibus magis remotis, sepalis minoribus differt.

Arbor circiter 8 m. alta (ex *Kerr*); ramuli quadrangulares, primo adpresse puberuli mox glabri, cortice brunneo obtecti. *Folia* elliptica, apice late obtusa vel subrotundata, basi cuneata, 12–16 cm. longa, 4–7 cm. lata, coriacea vel chartaceo-coriacea, utrinque griseo-brunnea viridi-tincta, glabra, nitida, nervis supra subconspicuis, costa subtus valde prominente, nervis lateralibus circa 18-paribus subtus prominulis parallelis angulo 70° e costa excurrentibus intra marginem arcuatim junctis, nervis transversis numerosis ± parallelis subtus subprominulis, margine integra

leviter recurva, petiolo circiter 3 cm. longo supra canaliculato puberulo vel glabro suffulta. *Inflorescentiae* axillares; flores deficientes; pedicelli 10–12 mm. longi, sparce aureo-puberuli. *Calyx* (in fructu) extra aureo-pubescens, intus glaber; sepala late ovata, apice obtusa vel subrotundata, ciliata, leviter carinata, 5 mm. longa et lata. *Fructus* esculentus (ex *Kerr*), ovoideus, 3 cm. longus, 1–1.5 cm. diametro, apice acuminatus, 1-spermus.

Pitsanulok, Panak, c. 300 m., by stream in deciduous forest, *Kerr* 8911. Kaw Chang, Klawng Mayom, c. 100 m., evergreen forest, *Kerr* 6931 (*type*).

Madhuca grandiflora *Fletcher* [Sapotaceae-Palaquiinae]; species *M. longifoliae* (Koen.) H. J. Lam affinis, sed pedicellis minoribus tomentosis nec paene glabris, fructibus juvenilibus glabris nec dense hirsutis differt.

Arbor circiter 15–20 m. alta (ex *Kerr*); ramuli crassi, rugosi, cicatricibus permultis foliorum inflorescentiarumque tecti, primo adpresse puberuli mox glabri, cortice brunneo vel cinereo obtecti. *Folia* ad ramulorum apices dispersa, lanceolata vel late oblanceolata, apice acuta vel fere mucronata basi cuneata, 5–20 cm. longa, 1.5–6 cm. lata, chartacea vel coriaceo-chartacea, utrinque brunnea vel griseo-brunnea, glabra vel subtus adpresse aureo-puberula, costa supra subconspicua subtus valde prominente, nervis lateralibus 20–22-paribus subtus subprominulis parallelis angulo 60–70° e costa excurrentibus intra marginem arcuatis, nervis transversis saepe obscuris, margine integra, petiolo 2–4.5 cm. longo glabro vel puberulo suffulta. *Inflorescentiae* multiflorae, ad ramulorum apices dispersae; pedicelli apice incrassati, adpresse fulvo-tomentosi, 1.75–2 cm. longi. *Calyx* intus et extra adpresse fulvo-pubescens; sepala 2 exteriora late ovata, 9 mm. longa, 6–7 mm. lata, apice late obtusa vel rotundata, ciliata, 2 interiora 5–6 mm. lata, 9 mm. longa, leviter carinata, apice obtusa, ciliata. *Corolla* extra glabra, 2.2–2.5 cm. longa; tubus crassus, late cylindricus, circiter 1.2 cm. longus; petala 12, imbricata, elliptica vel oblonga, 10–12 mm. longa, 4.5 mm. lata, apice rotundata; faux glabra. *Stamina* 28, fauce inserta; filamenta apice geniculata, 4 mm. longa; antherae 5 mm. longae, acuminatae, apice mucrone acuto glabro ornatae. *Ovarium* glabrum, 3 mm. diametro, 12-loculatum; stylus exsertus, glaber, filiformis, circiter 30 mm. longus. *Fructus* globosus vel ellipsoideus, 10–13 mm. longus, 10 mm. diametro.

Krat, Kan Chumpan, under 50 m., evergreen forest, *Kerr* 17659 (*type*). Krabin, Sakeo, c. 50 m., milky juice, scrub jungle, *Kerr* 9760. Krabin, Ban Keng, c. 25 m., open deciduous forest, *Kerr* 19856.

Madhuca grandifolia *Fletcher* [Sapotaceae-Palaquiinae]; species *M. macrophyllae* (Hasskarl) H. J. Lam affinis, sed foliis basi attenuatis nec rotundatis nec subcordatis, petiolis multo longioribus, pedicellis brevioribus differt.

Arbor circiter 10 m. alta (ex *Kerr*); ramuli crassi, ad 2 cm. diametro, cicatricibus permultis foliorum inflorescentiarumque tecti, glabri, cortice brunneo vel griseo-brunneo obtecti. *Folia* elliptica vel obovata, apice acuminata, basi attenuata, 25–65 cm. longa, 12–18 cm. lata, chartaceo-coriacea, utrinque brunnea glabra, costa supra valde impressa subtus manifeste prominente, nervis lateralibus circiter 20-paribus, supra subconspicuis subtus prominentibus parallelis angulo 45–50° e costa excurrentibus intra marginem arcuatim junctis, nervis transversis utrinque prominulis numerosis parallelis, margine integra, petiolo 8–15 cm. longo crasso supra canaliculato glabro suffulta. *Inflorescentiae* multiflorae, in axillis foliorum cicatricum positae. *Flores* non visi. *Calyx* (in fructu) extra adpresse fulvo-pubescens, intus glaber vel sparse pubescens; sepala late ovata, 7 mm. longa, 5 mm. lata, apice rotundata; pedicelli crassi, circiter 2.5 cm. longi, glabri vel sparse puberuli. *Fructus* ellipticus, 3.5–4 cm. longus, apice stylo persistente coronatus, rubiginoso-pilosus.

Pang-nga, Kao Katakwan, c. 400 m., evergreen forest, *Kerr* 18408.

Madhuca Kerrii *Fletcher* [Sapotaceae-Palaquiniinae]; species *M. punctatae* *Fletcher* affinis, sed foliis minoribus haud punctatis, floribus pedicellisque minoribus differt.

Arbor circiter 3 m. alta (ex *Kerr*); ramuli gracillimi, cicatricibus foliorum inflorescentiarumque tecti, primo puberuli mox glabri, cortice cinereo vel brunneo obtecti. *Folia* elliptica vel obovata, apice rotundata, basi cuneata, 4–9 cm. longa, 2–4 cm. lata, chartacea vel coriaceo-chartacea, supra griseo-brunnea viridi-tincta, subtus brunnea, utrinque glabra, costa supra conspicua subtus prominente, nervis lateralibus 10–12-paribus subtus subprominulis parallelis angulo 45–50° e costa excurrentibus intra marginem arcuatis, nervis transversis irregularibus, margine integra, petiolo 5–10 mm. longo puberulo vel glabro suffulta. *Inflorescentiae* in foliorum vel eorum cicatricum axillis positae, 3–6-florae; pedicelli sparse aureo-sericeo-pilosi, 8–12 mm. longi. *Calyx* extra aureo-pubescens, intus glaber vel sparse puberulus; sepala 2 exteriora ovata vel leviter elliptica, 5–6 mm. longa, 3 mm. lata, ciliata, apice late obtusa, 2 interiora leviter carinata, circa 5 mm. longa ciliata apice rotundata. *Corolla* alba (ex *Kerr*), extra glabra, circa 8 mm. longa; tubus 3 mm. longus; petala 8 imbricata, oblonga vel obovata, 5 mm. longa, 2 mm. lata, apice rotundata; faux hirsuto-villosa. *Stamina* fauce inserta, circiter 14–16; filamenta 2–2.5 mm. longa, hirsuto-villosa; antherae circiter 2 mm. longae, apice longe acuminatae. *Ovarium* aureo-pilosum, 1 mm. diametro, 7–8-loculatum; stylus exsertus, glaber, 8–9 mm. longus. *Fructus* ignotus.

Surin, Songka, c. 100 m., open deciduous forest, *Kerr* 8317 (*type*); light evergreen forest, *Kerr* 8261.

Madhuca punctata *Fletcher* [Sapotaceae-Palaquinae]; species *M. longifoliae* (Koen.) H. J. Lam affinis, sed foliis obovatis nec ellipticis, subtus minute punctatis, stylis longioribus differt.

Arbor circiter 7 m. alta (ex *Kerr*); ramuli crassi, cicatricibus foliorum inflorescentiarumque tecti, adpresse pubescentes, cortice brunneo obtecti. *Folia* obovata, apice emarginata, basi attenuata, 10–15 cm. longa, 5–8 cm. lata, coriacea, utrinque griseo-brunnea, subtus pallidiora, supra glabra costa primo excepta, subtus primo aureo-pilosa mox glabra, minute punctata, costa supra leviter impressa, subtus valde prominente, nervis lateralibus 12–16-paribus subtus prominulis parallelis angulo 50–70° e costa excurrentibus intra marginem arcuatis, nervis transversis numerosis irregularibus, margine integra, petiolo 2.5–3.5 cm. longo canaliculato piloso vel puberulo suffulta. *Inflorescentiae* in foliorum vel eorum cicatricum axillis positae, 3–6-florae; pedicelli cinereo- vel aureo-tomentosi, 2–3 cm. longi. *Calyx* intus et extra fulvo-tomentosus; sepala 2 exteriora late ovata, 7.5–8 mm. longa, 7 mm. lata, ciliata, apice rotundata, 2 interiora carinata, 7.5 m. longa, ciliata, apice rotundata. *Corolla* extra glabra, 10–11 mm. longa; tubus crassus, cylindricus, 5 mm. longus; petala 10, imbricata, oblonga, 5–6 mm. longa, 3–4 mm. lata, apice rotundata. *Stamina* fauce inserta, circiter 28; filamenta 2–2.5 mm. longa, crassa; antherae circiter 4 mm. longae, acuminatae, mucrone acuto glabro munitae. *Ovarium* conoideum, 2.5–3 mm. diametro, glabrum; stylus exsertus, filiformis, villosus, 12–13 mm. longus. *Fructus* ignotus.

Lampun, c. 330 m., deciduous forest, *Kerr* 3153.

Madhuca stipulacea *Fletcher* [Sapotaceae-Palaquinae]; species *M. grandiflorae* *Fletcher* affinis, sed foliis haud lanceolatis, nervis lateralibus paucioribus, stipulis carinatis, pedicellis longioribus, corolla minore differt.

Arbor parva, circiter 7–8 m. alta (ex *Kerr*); ramuli crassi, rugosi, cicatricibus permultis foliorum inflorescentiarumque tecti, primo adpresse puberuli mox glabri, cortice brunneo obtecti. *Folia* oblongo-obovata vel oblongo-oblanceolata, apice rotundata, basi cuneata, 6–13 cm. longa, 2.5–7 cm. lata, coriacea vel chartaceo-coriacea, supra brunnea vel viridi-brunnea, subtus pallidiora, utrinque glabra, costa supra subconspicua vel leviter impressa subtus valde prominente, nervis lateralibus 10–13-paribus subtus prominulis parallelis angulo 45° e costa excurrentibus intra marginem arcuatis, nervis transversis validis irregularibus, margine integra, petiolo 2–2.5 cm. longo glabro vel sparse pubescente suffulta; stipulae lanceolatae, circa 10 mm. longae, valide carinatae. *Inflorescentiae* multiflorae, ad ramulorum apices dispersae; pedicelli apice incrassati, griseo-sericeo-pubescentes, 3.5–4 cm. longi. *Calyx* intus et extra sericeo-pubescens; sepala 2 exteriora late ovata, circiter 8 mm. longa, 7 mm. lata, apice rotundata, ciliata, 2 interiora late ovata vel subrotundata, 8–8 mm. longa, 7–8 mm. lata, leviter

carinata, longe ciliata. *Corolla* rubicundo-alba (ex *Winit*), extra glabra, circiter 11–12 mm. longa; tubus crassus, cylindricus, 4 mm. longus; petala 14, imbricata, oblonga, 7–8 mm. longa, 2 mm. lata, apice obtusa vel rotundata; faux hirsuto-pilosa. *Stamina* 28, fauce inserta, subsessilia; antherae 4·5–5 mm. longae, acuminatae, apice mucrone obtuso sparse piloso vel glabro praeditae. *Ovarium* circiter 2 mm. diametro, glabrum, 10-loculatum; stylus exsertus, glaber, filiformis, 13 mm. longus. *Fructus* globosus, 1·5 cm. diametro.

Chiengmai, Me Kang, c. 420 m., pê forest, *Winit* 1295 (*type*). Lampun, Me Li, c. 270 m., pê forest, *Winit* 1562. Lampang, Che Sawn, c. 400 m., dry deciduous forest, *Kerr* 4772. Utaradit, c. 100 m., by side of dry stream in open deciduous forest, *Kerr* 5898.

Diploknema siamensis *Fletcher* [Sapotaceae-Palaquiinae]; species *D. butyraceae* (Roxb.) H. J. Lam affinis, sed foliis subtus glabris nec pilosis, floribus pedicellisq. minoribus ferrugineo-pubescentibus nec aureo-pubescentibus differt.

Arbor circiter 10 m. alta (ex *Kerr*); ramuli crassi, cicatricibus permultis foliorum inflorescentiarumque tecti, primo adpresse puberuli mox glabrescentes, cortice brunneo vel griseo-brunneo obtecti. *Folia* elliptica vel obovata, apice rotundata vel obtusa, basi cuneata, 20–45 cm. longa 7–18 cm. lata, chartaceo-coriacea, utrinque brunnea, subtus pallidiora, glabra, costa supra valde impressa subtus prominente, nervis lateralibus circa 16-paribus, supra leviter impressis subtus subprominentibus parallelis angulo 45°–50° e costa excurrentibus intra marginem arcuatim junctis, nervis transversis validis numerosis \pm parallelis, margine integra, petiolo 4–12 cm. longo supra canaliculato puberulo vel glabro suffulta. *Inflorescentiae* multiflorae, in axillis foliorum cicatricum positae; pedicelli apice incrassati, ferrugineo-pubescentes, 1·5–2 cm. longi. *Calyx* intus et extra sericeo-pubescentis; sepala 2 exteriora ovata, 7·5–8 mm. longa, 5·5–6 mm. lata, ciliata, apice rotundata, interiora 3 ovata vel elliptica, 6·5–7 mm. longa, 4·5–5 mm. lata, ciliata, apice rotundata. *Corolla* alba (ex *Kerr*), extra glabra vel puberula, 11–12 mm. longa; tubus crassus, cylindricus, 4 mm. longus; petala 14, imbricata, obovata vel oblonga, 6–7 mm. longa, 2·5 mm. lata, apice rotundata; faux sparse fulvo-villosa. *Stamina* 0. *Staminodia* 26–28, fauce inserta, petaloidea, 5–6 mm. longa, 0·5–1 mm. lata, apice rotundata et dentata. *Ovarium* aureo-vel fulvo-pilosum, 2 mm. diametro, 9-loculatum; stylus exsertus, basi sparse pilosus, crassus, cavatus, 10 mm. longus.

Chumpawn, Siepyuan, c. 20 m., evergreen forest, *Kerr* 16260.

Payena punctata *Fletcher* [Sapotaceae-Palaquiinae]; species *P. lucidae* DC. affinis, sed foliis subtus punctatis differt.

Arbor circiter 35 m. alta (ex *Kerr*); ramuli teretes, primo ferrugineo-pubescentes, cortice brunneo obtecti. *Folia* elliptica vel oblongo-elliptica, apice attenuata, obtusa, basi cuneata, 7–10 cm.

longa 2–3 cm. lata, chartacea, utrinque cinerea glabraque nisi subtus ad costam tenuiter ferrugineo-pubescentia, subtus manifestius punctata, costa supra subconspicua subtus prominente, nervis lateralibus numerosis parallelis supra impressis subtus subprominulis angulo 60–70° e costa excurrentibus intra marginem arcuatim junctis, margine integra, petiolo 1.5–2 cm. longo canaliculato ferrugineo-pubescente suffulta. *Inflorescentiae* in foliorum axillis posita, 3–6-florae; pedicelli aureo-pubescentes, apicem versus incrassati, circiter 1.5 cm. longi. *Calyx* extra adpresse aureo-pubescent, intus aureo-puberulus; lobi 4, late ovati, 5 mm. lati et longi, apice obtusi vel rotundati, ciliati, crassi, 2 interiores tenuiores, 2 exteriores crassiores. *Corolla* alba (ex *Kerr*), extra adpresse aureo-pubescent, immatura; tubus circa 3 mm. longus, intus glaber; lobi 8, 4 exteriores et 4 interiores, elliptici vel oblongo-elliptici, 4.5–5 mm. longi, 2.5–3 mm. lati, apice rotundati ciliolati. *Stamina* 16–18, fere sessilia, filamentis crassis, antheris acuminatis 2–5.5 mm. longis. *Ovarium* ferrugineo-pilosum, 8-loculatum, 2.5 mm. diametro; stylus 10 mm. longus, basi pilosus.

Satul, Adang, c. 50 m., evergreen forest, *Kerr* 14027.

Represented by a small twig only, but clearly distinguished from all other collections by the glandular punctate lower surface of the leaves.

***Sarcosperma siamense* Fletcher** [Sarcospermaceae]; species *S. arboreo* Benth. affinis, sed foliis ramulisque tomentosis differt.

Arbor circiter 6 m. alta (ex *Kerr*); ramuli teretes, primo tomentosi mox pubescentes, cortice cinereo vel cinereo-brunneo obtecti. *Folia* opposita, oblonga vel ovato-oblonga, 20–30 cm. longa, 6–12 cm. lata, apice subito acuminata, basi cuneata vel subrotundata, chartaceo-coriacea, utrinque brunnea, supra glabra, subtus et praesertim ad nervos ferrugineo-tomentosa, costa supra subconspicua vel leviter impressa subtus valde prominente, nervis lateralibus 15–16 paribus supra leviter impressis subtus prominentibus parallelis angulo 50° e costa excurrentibus intra marginem arcuatis (glandulis axillaribus praesentibus), nervulis supra impressis subtus prominulis numerosis parallelis, margine integra, petiolo 5–7 mm. longo tomentoso suffulta; stipulae lineares, 5 mm. longae, deciduae. *Inflorescentiae* oppositae, axi dense ferrugineo-tomentoso; bractae ovatae. *Sepala* rotundata, subaequalia, valde imbricata, tria exteriora crassa pilosa, duo interiora minus crassa margine lato hyalino. *Corolla* decidua, tubo brevi, lobis 5 rotundatis imbricatis. *Stamina* 5, tubo corollae affixa, filamentis brevissimis, antheris ovatis obtusis; staminodia 5, ovata, attenuata. *Ovarium* glabrum, 2-loculatum, loculis uniovulatis, ovulis erectis; stylus subbifidus. *Fructus* ignotus.

Nan, Hui Kua, c. 300 m., evergreen forest by stream, *Kerr* 5027.

***Huodendron siamicum* Fletcher** [Styracaceae] species *H. biaristato* (W. W. Sm.) Rehd. affinis, sed nervis lateralibus numerosioribus,

reticulatione utrinque magis prominula, floribus paucioribus minoribus differt.

Arbor circiter 20 m. alta (ex *Kerr*) ; ramis gracilibus teretibus vel apicem versus leviter complanatis pubescentibus vel glabris. *Folia* alterna, elliptica vel oblongo-elliptica, 8–15 cm. longa, 3–6 cm. lata, apice longe attenuata, basi cuneata, chartacea, utrinque viridia, glabra, costa supra impressa subtus valde prominente, nervis lateralibus circiter 10-paribus supra subconspicuis vel leviter impressis subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis numerosis parallelis, nervulis numerosis utrinque prominulis, margine integra vel leviter et remote denticulata, petiolo 8–10 mm. longo supra canaliculato puberulo vel glabro suffulta. *Inflorescentia* dense albo-tomentosa, corymboso-paniculata ; pedicelli circa 5 mm. longi. *Calycis* tubus cupuliformis, 1.5 mm. longus, tomentosus, dentibus triangulari-ovatis dimidium tubum subaequantibus ciliatis. *Petala* alba (ex *Kerr*), oblonga, 6.5–7 mm. longa, filamentis compressis utrinque dense pilosulis circiter 2.5 mm. longis, antheris glabris connectivo dorso puberulo in appendicem tridentatum elongato, dentibus lanceolatis acutis. *Stylus* staminibus paulo longior, crassus, dense pilosulus, apice 3–4-lobatus ; discus pilosus.

Ranawng, Kao Pawta Luang Keo, c. 500 m., evergreen forest, *Kerr* 16909.

Ardisia oxystemon *Ridley* ms., descr. *Fletcher* (Myrsinaceae-Eumyrsineae) ; *A. porosae* C. B. Clarke affinis, sed floribus minoribus, pedicellis paene absentibus nec circiter 1.5 cm. longis differt.

Frutex circiter 3 m. altus (ex *Kerr*) ; ramuli teretes vel leviter complanati, glabri, brunnei vel griseo-brunnei. *Folia* elliptica, 10–22 cm. longa, 4–10 cm. lata, apice acuta vel obtusa, basi cuneata vel saepe subrotundata, chartacea, supra cinerea vel cinereo-brunnea, subtus pallidiora, utrinque glabra, lepidibus minutissimis peradpressis consita, leviter glandulosa, costa supra subconspicua vel leviter impressa subtus valde prominente, nervis lateralibus circiter 12-paribus subtus prominulis parallelis intra marginem arcuatim junctis, margine integra, petiolo 5–10 mm. longo crasso glabro supra complanato vel canaliculato suffulta. *Inflorescentia* terminalis, ad 15 cm. longa, minute ferrugineo-puberula vel glabra, ex umbellis racemose composita ; pedicelli circiter 1 mm. longi vel paene absentes. *Sepala* basi breviter coalita, ovata, 1.5 mm. longa, 1 mm. lata, apice rotundata, dorso sparse puberula, glandulosa, ciliolata. *Corolla* punicea (ex *Kerr*) ; tubus brevis ; lobi ovati, apice obtusi, 5 mm. longi, 3 mm. lati, bene glandulosi. *Stamina* petalis subaequilonga, antheris 4 mm. longis acutis dorso punctatis, filamentis 1–1.5 mm. longis. *Ovarium* subglobosum, circiter 1 mm. diametro ; stylus 5 mm. longus. *Bacca* globosa, 6 mm. diametro.

Chumpawn, Ta Ngaw, c. 50 m., evergreen forest, *Kerr* 11459 : Surat, Ban Kawp Kep, c. 100 m., evergreen on rocky limestone hill,

Kerr 13361 : Pang-nga, Tap-put, c. 100 m., light evergreen forest, *Kerr* 18546 : Krabi, c. 50 m., evergreen at foot of limestone hill, *Kerr* 18841 (*type*) : Trang, *H. C. Robinson* 6411 : near stream, *Mrs. D. J. Collins* 2394 : Patalung, Kao Oktalu, c. 100 m., evergreen on limestone hill, *Kerr* 15332 : Tungsong, *Put* 2339 : Yula, Banang Sta, c. 50 m., abundant in undergrowth of evergreen forest, *Kerr* 7298.

***Diospyros betongensis* Fletcher** [Ebenaceae] ; *D. ellipsoideae* King et Gamble affinis, sed foliis oblongis subtus glabris, nervis supra haud impressis, fructibus globosis nec ellipsoideis differt.

Arbor gracilis, circiter 5 m. alta (ex *Kerr*) ; ramuli quadrangulares, cavi, glabri, cortice brunneo vel cinereo paucilenticellato obtecti. *Folia* oblonga, apice acuminata, acuta, basi rotundata, 30–40 cm. longa, 7–10 cm. lata, chartaceo-coriacea, nitida, utrinque brunnea viridi-tincta, glabra, subtus lepidibus minutis albis instructa, costa supra subconspicua vel leviter impressa subtus valde prominente lenticellis paucis praedita, nervis lateralibus 10–14-paribus supra subconspicuis subtus prominentibus parallelis intra marginem anastomosantibus, nervis transversis paucis irregularibus cum nervulis utrinque prominulis, margine integra leviter recurva, petiolo circiter 7 mm. longo supra complanato apicem versus canaliculato glabro suffulta. *Flores* deficientes. *Fructus* brevissime pedicellatus ; calyx mox deciduus ; bacca globosa, 2 cm. diametro, primo leviter ferrugineo-pilosa mox glabrescens, disperma ; semina lateraliter compressa, 12 mm. lata et longa, rugosa.

Pattani, Bétong, c. 400 m., evergreen forest, *Kerr* 7673.

***Diospyros bracteata* Fletcher** [Ebenaceae] ; *D. castaneae* (Craib) Fletcher* affinis, sed foliis minoribus supra valde nitidis ovatis vel ellipticis nec oblongo-rotundatis basi nunquam cordatis, corollae lobis maioribus differt.

Arbor circiter 7 m. alta (ex *Kerr*) ; ramuli quadrangulares vel teretes, glabri, brunnei vel nigri, lenticellis numerosis elongatis praediti. *Folia* ovata vel elliptica, apice rotundata vel leviter cuneata, 6–10 cm. longa, 2.5–5 cm. lata, chartaceo-coriacea, sicco castanea, infra pallidiora, utrinque glabra, supra nitida, costa supra subconspicua vel leviter impressa subtus prominente, nervis lateralibus circiter 10-paribus supra subconspicuis infra prominulis, nervulis paucis utraque pagina subconspicuis, margine integra, petiolo 5–8 mm. longo supra apicem versus canaliculato glabro suffulta. *Inflorescentia* mascula axillaris, sessilis, basi dense imbricatim bracteata, rhachi bracteisque extra sericeis ; bractee florales naviculiformes, circiter 4 mm. longae, deciduae. *Calyx* ellipsoideo-tubulosus, breviter 3-lobatus, 8 mm. longus, 4 mm. diametro, extra sericeus. *Corolla* alba (ex *Kerr*) ; tubus 8 mm. longus, extra basi glaber superne dense sericeus ; lobi 3, oblongo-elliptici, 10 mm.

* *Diospyros castanea* (Craib) Fletcher, comb. nov.—*Maba castanea* Craib in Kew Bull. 1915, 432.

longi, 5 mm. lati, apice obtusi vel subrotundati, utrinque sericei. *Stamina* 12, antheris obtusis circiter 2 mm. longis, filamentis 1–2 mm. longis apice saepe geniculatis.

Udawn, Nawng Bua, c. 200 m., open deciduous forest, *Kerr* 2615. Kukan, Kantararom, c. 100 m., open scrub, *Kerr* 8326 (*type*).

***Diospyros brachiata* King et Gamble var. *lanceolata* Fletcher**, a typo foliis late lanceolatis nec elliptico-oblongis differt.

Puket, Kamala, c. 50 m., scrub, *Kerr* 17412.

***Diospyros calcarea* Fletcher** [Ebenaceae]; *D. sinensi* Hemsl. affinis, sed foliis pedicellisque fructibusque minoribus, fructibus glabris, calycis lobis brevioribus haud prominenter venosis differt.

Frutex scandens (ex *Kerr*); ramuli graciles, teretes, primo leviter albo-pilosi mox glabrescentes, spinosissimi, cortice brunneo vel cinereo-brunneo obtecti. *Folia* ovata vel elliptica, 1.5–5 cm. longa, 1–1.75 cm. lata, apice attenuata, acuta vel obtusa, basi cuneata vel rotundata vel cordulata, chartacea, utrinque viridia vel brunnea, subtus pallidiora, pagina superiore sparse puberula vel saepe glabrescente, inferiore juventute sparse pubescente mox paene glabra leviter glandulosa, costa supra subconspicua subtus prominente, nervis lateralibus 3–4 paribus supra subconspicuis subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis nervulisque utrinque obscuris, margine integra, petiolo 2 mm. longo leviter piloso suffulta. *Flores masculi* albi (ex *Kerr*), axillares; pedicelli circiter 2 mm. longi, graciles, pilosi. *Calyx* extra sparse pubescens, usque ad basin 4-partitus, segmentis ovatis 1.5 mm. longis 1 mm. latis apice acutis valde ciliatis. *Corolla* glabra, urceolata; tubus 3.5 mm. altus; lobi 4, valde imbricati, subrotundati, 3 mm. lati, patentes. *Stamina* 14–16, per paria connata, antheris 3–4 mm. longis acutis, filamentis brevibus. *Ovarium* obsoletum. *Flores feminei* ignoti. *Fructus* axillares, solitarii; pedicelli 4–6 mm. longi, puberuli vel glabri, apice incrassati cum calyce articulati; calyx intus et extra leviter puberulus, usque ad basin 4-partitus, segmentis ovatis 10 mm. longis 6 mm. latis apice obtusis vel subrotundatis patentibus; fructus globosus, 10 mm. diametro.

Kanburi, Wang Kanai, c. 50 m., limestone rocks, *Kerr* 12870. Prachuap, Sam Roi Yawt, under 50 m., evergreen forest on limestone hill, *Kerr* 10976 (*type*).

***Diospyros coetanea* Fletcher** [Ebenaceae]; *D. saxosae* Fletcher affinis, sed nervis lateralibus numerosioribus, reticulatione scalariformi, floribus coetaneis maioribus differt.

Arbor circiter 20 m. alta (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, primo ferrugineo-pubescentes mox glabrescentes, cortice cinereo paucilenticellato obtecti. *Folia* elliptica vel oblongo-elliptica, ad 20 cm. longa, ad 7 cm. lata, apice acuta, basi cuneata,

chartaceo-coriacea, utrinque brunnea, pagina superiore glabra, inferiore leviter adpresse pubescente, costa supra impressa subtus valde prominente, nervis lateralibus circiter 20-paribus supra subconspicuis subtus prominulis parallelis intra marginem anastomosantibus, nervis transversis numerosis parallelis utrinque subprominulis scalariformiter currentibus, margine integra leviter recurva, petiolo 7-10 mm. longo supra canaliculato glabro suffulta. *Flores masculi* cum foliis coetanei, in cymis axillaribus breviter pedicellatis dispositi. *Calyx* intus et extra ferrugineo-pilosus; tubus 4-5 mm. altus; lobi 4-5, late triangulares, 5 mm. longi, 5 mm. lati, apice acuti. *Corolla* tubulosa, extra basi excepta ferrugineo-pilosa; tubus 10 mm. longus, intus glaber; lobi 4-5, imbricati, reniformes, 2-5 mm. longi, 4 mm. lati, reflexi. *Stamina* 10, per paria connata, antheris 3-4 mm. longis lanceolatis apice acutis, filamentis communi 1 mm. longo, filamentis partialibus 1-1.5 mm. longis glabris. *Ovarium* obsoletum, conicum, 1 mm. longum, apice pilis paucis albis ornatum.

Mê Hawng Sawn, Hui Pong Dan, c. 400 m., mixed forest, *Kerr* 5466 (*type*), Prê Mê Song, c. 330 m., *Vanpruk* 295. Nakawn Tai, c. 300 m., mixed deciduous forest, *Kerr* 8890.

Diospyros defectrix Fletcher [Ebenaceae]; *D. cauliflorae* Blume affinis, sed floribus femineis solitariis nec paniculatis differt.

Frutex circiter 3 m. altus (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, primo leviter ferrugineo-pubescentes mox glabrescentes, cortice brunneo vel cinereo paucilenticellato obtecti. *Folia* ovata vel ovato-oblonga, apice lata obtusa, basi rotundata vel cordulata, 10-15 cm. longa, 4-7 cm. lata, chartaceo-coriacea, utrinque brunnea (subtus pallidiora), glabra, subtus lepidibus minutis albis paucis instructa, costa supra impressa subtus prominente, nervis lateralibus 6-8-paribus supra leviter impressis subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis paucis plus minusve irregularibus cum nervulis subtus subprominulis, margine integra leviter recurva, petiolo 5-10 mm. longo supra canaliculato adpresse ferrugineo-puberulo suffulta. *Flores feminei* solitarii, in axillis foliorum vel eorum cicatricum positi, breviter pedicellati, basi bracteati, bracteis extra dense pilosis. *Calyx* intus et extra adpresse aureo-pilosus; tubus 1.5 mm. altus; lobi 4-5, late ovati, basi imbricati, 3-5 mm. longi, 3 mm. lati, apice obtusi. *Corolla* alba (ex *Kerr*); tubus 3-3.5 mm. longus, basi glaber, superne breviter aureo-pilosus; lobi 4-5, late ovati vel subrotundati, 3 mm. longi, 2.75-3 mm. lati, apice obtusi vel subrotundati, dorso aureo-pilosi. *Staminodia* 0. *Ovarium* subglobosum, 2 mm. longum, 1.5 mm. diametro, dense aureo-pilosum, 4-loculatum, loculis uniovulatis; stylus brevis, bilobatus.

Kaw Tao, under 5 m., evergreen forest, *Kerr* 12676A, *Ke* 12677 (*type*).

The specific epithet refers to the lack of staminodes in the ♀ flower.

Diospyros fulvo-pilosa *Fletcher* [Ebenaceae]; *D. strictae* Roxb. affinis, sed floribus masculis paucioribus, calycis lobis florum feminorum minoribus, fructibus pilosis nec glabris differt.

Arbor parva, circiter 7 m. alta (ex *Kerr*) ; ramuli graciles, teretes, dense fulvo-pilosi, cortice nigro vel cinereo-nigro obtecti. *Folia* ovata vel ovata-elliptica, apice attenuata basi cuneata, 5–10 cm. longa, 2–4 cm. lata, chartacea, nigra, nitida, pagina superiore costa excepta glabra, inferiore ad costam dense pilosa, nervis lateralibus pubescentibus, costa supra impressa subtus prominente, nervis lateralibus 8–10-paribus subtus prominulis parallelis intra marginem anastomosantibus, nervis transversis nervulisque obscuris, margine integra leviter recurva, petiolo 3 mm. longo dense fulvo-pilosa suffulta. *Flores masculi* pallido-flavi (ex *Kerr*), axillares, solitarii vel 2-fasciculati, subsessiles vel breviter pedicellati. *Calyx* usque ad basin 4-partitus, segmentis subrotundatis 2.5 mm. latis apice leviter apiculatis extra dense pilosis intus glabris vel puberulis ciliatis. *Corollae* tubus 4 mm. longus, extra glaber intus cinereo-puberulus ; limbus 4-partitus, segmentis subrotundatis 2.5 mm. latis apice truncatis intus et extra cinereo-puberulis. *Stamina* 16, per paria connata, antheris 2 mm. longis glabris breviter acuminatis, filamentis crassis 3 mm. longis leviter pilosis. *Ovarium* obsoletum, sparse pilosum. *Flores feminei* axillares, solitarii, breviter pedicellati. *Calyx* usque ad basin 4-partitus, segmentis late ovatis vel subrotundatis 5 mm. latis apice rotundatis extra pilosis intus glabris vel puberulis ciliatis. *Corolla* extra leviter pilosa ; tubus 6 mm. longus, intus leviter subpilosus ; limbus 4-partitus, segmentis oblongis 4.5–5 mm. longis 3 mm. latis apice rotundatis vel truncatis intus pilosis. *Staminodia* 9, lanceolata, 5 mm. longa, pilosa. *Ovarium* conoideum, 3 mm. diametro, fulvo-pilosum, 4-loculatum, loculis uniovulatis. *Fructus* (probabiliter immaturus) ellipticus, 10 mm. longus, 7 mm. diametro, fulvo-pilosus, stylo apice persistente, 4-loculatus, loculis 1-spermis.

Krabi ; Tambon Kao Panom, c. 100 m., evergreen forest, *Kerr* 18785. Satul, Ban Ton, c. 50 m., by stream in evergreen forest, *Kerr* 14426 (*type*).

Diospyros gracilis *Fletcher* [Ebenaceae] ; *D. sinensi* Hemsl. affinis, sed ramulis haud armatis, pedicellis fructuum minoribus, calycis lobis brevioribus differt.

Arbor parva, circiter 5 m. alta (ex *Kerr*) ; ramuli graciles, obtuse quadrangulares, primo puberuli mox glabri, cortice brunneo paucilenticellato obtecti. *Folia* ovata vel ovato-oblonga, apice obtusa, basi leviter cuneata vel rotundata vel subcordulata, 3–10 cm. longa, 1.5–3 cm. lata, coriacea, utrinque brunnea vel cinereo-brunnea subtus pallidiora, pagina superiore nitida ad costam puberula ceterum glabra, subtus omnino glabra, costa supra subconspicua vel leviter impressa subtus prominente, nervis lateralibus 8–10-paribus mox ascendentibus parallelis intra marginem arcuatim

junctis cum nervis transversis utrinque subprominulis vel saepe plus minusve obscuris, reticulatione laxa, margine integra, petiolo 4-6 mm. longo supra complanato ferrugineo-puberulo suffulta. *Flores* deficientes. *Fructus* axillares; pedicelli 4-5 mm. longi, apice incrassati, sparse puberuli vel glabri; calyx ad basin 4-partitus, segmentis leviter patentibus late ovatis 6-7 mm. longis 6 mm. latis apice obtusis intus et extra leviter glandulosis glabris vel sparse puberulis prominentibus nervosis; bacca globosa, ad 2 cm. diametro, breviter apiculata, adpresse ferrugineo-pubescentis interdum paene glabra, 4-loculata, loculis 1-spermis; semina fabiformia.

Korat, Chantūk, Tachang, c. 300 m., evergreen forest, *Kerr* 9982. Korat, Chantūk, c. 150 m., evergreen forest, *Anuwat* 84. Chaibadan, Dong Paya Yen, c. 50 m., mixed forest, *Kerr* 7993 (*type*). Saraburi, Hin Lap, *Put* 2406.

Diospyros addita *Fletcher* [Ebenaceae]; *D. transitoriae* Bakh. affinis, sed foliis haud areolatis, seminibus paucioribus latioribus haud nitidis, albumine haud ruminato differt.

Arbor; ramuli obtuse quadrangulares, primo sparse puberuli mox glabri, cortice brunneo vel cinereo-brunneo vel cinereo paucilenticellato obtecti. *Folia* ovata vel sublanceolata, 5-13 cm. longa, 2-5 cm. lata, apice obtusa, basi leviter cuneata vel rotundata, coriacea, utrinque brunnea subtus pallidiora, glabra, pagina superiore valde nitida, costa supra conspicua subtus prominente, nervis lateralibus 8-10-paribus supra subconspicuis subtus subprominentibus parallelis intra marginem anastomosantibus, nervis transversis numerosis parallelis supra obscuris subtus prominulis vel per occasionem paene obscuris, reticulatione laxa inconspicua, margine integra leviter recurva, petiolo circiter 10 mm. longo crasso supra complanato glabro suffulta. *Flores* deficientes. *Fructus* axillares; pedicelli 3-5 mm. longi, crassi, cinereo- vel fulvo-puberuli; calyx usque ad basin 5-partitus, segmentis late ovatis vel subrotundatis 8-10 mm. longis 8 mm. latis basi valde imbricatis intus glabris extra sparse puberulis vel glabris patentibus vel reflexis conspicue nervatis; bacca globosa vel obscure 3-lobata, 3-3.5 cm. diametro, breviter apiculata, 4-sperma; semina 2 cm. longa.

Krabin, Aran Pratet, *Put* 3109.

Diospyros monosperma *Fletcher* [Ebenaceae]; *D. simili* Craib affinis, sed ramulis foliis calycibusque femineis minus ferrugineo-pilosis, nervis supra minus impressis, petiolis longioribus differt.

Arbor circiter 4 m. alta (ex *Kerr*); ramuli graciles, teretes vel obtuse quadrangulares, primo conspicue ferrugineo-pilosi, mox glabrescentes, cortice brunneo vel cinereo-brunneo paucilenticellato obtecti. *Folia* elliptica vel oblongo-elliptica, apice late obtusa, basi cuneata vel rotundata, ad 16 cm. longa, ad 6 cm. lata, chartaceo-coriacea, utrinque brunnea subtus pallidiora, pagina superiore glabra inferiore leviter pilosa, costa supra impressa subtus valde

prominente, nervis lateralibus circiter 6-paribus supra impressis subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis paucis irregularibus, reticulatione laxa supra subconspicua vel saepe obscura, margine integra leviter recurva, petiolo 5–8 mm. longo ferrugineo-piloso supra apicem versus canaliculato suffulta. *Flores* deficientes. *Fructus* subsessiles; calyx extra adpresse ferrugineo-pilosus, intus dense adpresse ferrugineo-sericeus; tubus 3 mm. altus; lobi 4, late ovati vel late triangulares, circiter 5 mm. longi, 4 mm. lati; bacca immatura ellipsoidea, ad 10 mm. longa, ad 6 mm. diametro, breviter apiculata, leviter adpresse ferrugineo-pilosa, 4-loculata, 1-sperma.

Kaw Tao, near sea level, common in dry evergreen forest behind beach, *Kerr* 11108.

Diospyros fecunda *Fletcher* [Ebenaceae]; *D. transitoriae* Bakh. affinis, sed foliis ellipticis nec ovatis chartaceis nec coriaceis minute nec conspicue areolatis, seminibus numerosioribus, albumine haud ruminato differt.

Arbor circiter 7 m. alta (ex *Kerr*); ramuli teretes, primo sparse puberuli mox glabri, cortice brunneo paucilenticellato obtecti. *Folia* elliptica, 10–14 cm. longa, 4–7 cm. lata, apice attenuata, obtusa, basi cuneata, chartacea, minute areolata, pagina superiore griseo-brunnea viridi-tincta, inferiore brunnea glabra, costa supra impressa subtus prominente, nervis lateralibus 5–7-paribus supra subconspicuis subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis paucis irregularibus utrinque subprominulis, reticulatione laxa plus minusve obscura, margine integra leviter recurva, petiolo 8–12 mm. longo glabro supra canaliculato suffulta. *Flores* deficientes. *Fructus* e ramis annotinis orientes, in axillis foliorum cicatricum positi; pedicelli crassi, 5 mm. diametro, circiter 3–5 mm. longi; calyx extra sparse pubescens; tubus 2–3 mm. altus; lobi 5–6, triangulares, circiter 5 mm. longi, 5 mm. lati, apice obtusi, intus ferrugineo-sericei, patentes vel reflexi; bacca globosa, 4 mm. diametro, ferrugineo-sericea, maturitate glabrescens, 14–16-sperma; semina elliptica, plana, 15–17 mm. longa, 7 mm. lata.

Yala, Betong, c. 400 m., evergreen forest, *Kerr* 7658.

Diospyros bambuseti *Fletcher* [Ebenaceae]; *D. ferreae* (Willd.) Bakh. affinis, sed tubo lobisque corollae masculae subaequalibus, staminibus numerosioribus, ovario glabro differt.

Arbor circiter 20 m. alta; truncus basi striatus (ex *Kerr*); ramuli teretes, primo ferrugineo-pilosi mox glabri, cortice brunneo vel cinereo-brunneo obtecti. *Folia* elliptica vel oblongo-elliptica, apice obtusa vel subrotundata saepe emarginata, basi cuneata vel subrotundata, 3–8 cm. longa, 1.5–2.5 cm. lata, chartaceo-coriacea, utrinque brunnea glabra, costa utrinque parce pubescente supra impressa subtus prominente, nervis lateralibus circiter 10–12-paribus supra et infra conspicuis vel subprominulis parallelis intra marginem arcuatim junctis, nervis transversis paucis irregularibus,

nervulis numerosis subtus subprominulis vel saepe obscuris, margine integra leviter recurva, petiolo circiter 2 mm. longo supra valde canaliculato piloso suffulta. *Inflorescentiae masculae* axillares, e ramulis junioribus orti, 3-florae, dense bracteatae, rhachi bracteisque extra dense pilosis. *Calyx* extra glaber; tubus 1-1.5 mm. longus; lobi late ovati, 1-1.5 mm. lati, 1 mm. longi, apice rotundati, valde ciliolati. *Corolla* alba (ex Kerr), glabra; tubus 2 mm. longus; lobi 3, 2 mm. longi, 2-5 mm. lati, apice rotundati. *Stamina* 18, filamentis 1-1.5 mm. longis, antheris 1 mm. longis. *Ovarium* inchoatum, glabrum.

Krabin, Aranya, under 50 m., bamboo forest, Kerr 19325.

Diospyros Putii Fletcher [Ebenaceae]; *D. castaneae* (Craib) Fletcher* affinis, sed calyce ♀ alte lobato nec truncato, foliis chartaceis maioribus differt.

Arbor; ramuli teretes, primo puberuli mox glabrescentes, brunnei vel cinereo-brunnei, lenticellis numerosis elevatis praediti. *Folia* elliptica vel ovato-elliptica, apice obtusa vel subrotundata, basi cuneata, 10-26 cm. longa, 6-12 cm. lata, chartacea, utrinque brunnea subtus pallidiora, glabra, costa utrinque sparse puberula supra subconspicua vel leviter impressa subtus valde prominente, nervis lateralibus 10-12-paribus patentibus parallelis supra impressis subtus prominulis intra marginem arcuatim junctis, nervis transversis paucis irregularibus, nervulis numerosis pagina superiore impressis pagina inferiore subprominulis, margine integra, petiolo 1 cm. longo supra apicem versus canaliculato primo puberulo suffulta. *Flores feminei* axillares, singuli, e ramulis junioribus orti; pedicelli 1 cm. longi, crassi, dense pilosi. *Calyx* intus et extra sericeus; tubus 1.5 mm. longus; lobi 4, late ovati, 8-10 mm. longi, 6 mm. lati, apice acuti vel obtusi. *Corollae* tubus 4-5 mm. longus, extra basi glaber, superne pilosus; lobi 4, subrotundati, 5 mm. diametro, revoluti, ciliati. *Ovarium* subglobosum, dense aureo-pilosum, 6-loculatum, loculis uniovulatis; stylus brevis, trilobatus.

Korat, Ban Chum Seng, Put 2834.

Diospyros saxosa Fletcher [Ebenaceae]; *D. ovalifoliae* Wight affinis, sed albumine radiatim striato differt; nec non *D. cauliflorae* Blume affinis, sed fructibus 1- nec 4-8-spermis differt.

Arbor parva, circiter 5 m. alta (ex Kerr); ramuli teretes, primo ferrugineo-puberuli, mox glabrescentes, cortice brunneo vel griseo-brunneo paucilenticellato obtecti. *Folia* ovata vel ovato-oblonga, apice obtusa, basi rotundata vel subcuneata, 6-12 cm. longa, 2-5 cm. lata, coriacea, utrinque brunnea subtus pallidiora viriditincta, pagina superiore glabra nitida, inferiore juventute adpresse pubescente demum plus minusve glabrescente, costa supra impressa subtus prominente, nervis lateralibus 8-10-paribus supra impressis

* Vide supra, p. 382.

vel subconspicuis subtus prominulis parallelis intra marginem arcuatim junctis, reticulatione laxa supra obscura vel leviter subconspicua subtus subprominula, margine integra, petiolo 5-7 mm. longo supra plano apicem versus canaliculato ferrugineo-puberulo vel glabro suffulta. *Flores masculi* in cymis axillaribus breviter pedunculatis dispositi. *Calyx* intus et extra aureo-pilosus; tubus 1 mm. altus; lobi 4, late ovati, 2 mm. longi et lati, valde ciliati, apice acuti. *Corolla* sparse puberula; tubus 4 mm. altus; lobi 4, late ovati, 2 mm. longi et lati, apice obtusi vel subacuti, leviter reflexi, basi imbricati, dorso pilosi. *Stamina* 16, per paria connata, filamentis 1.5 mm. longis glabris, antheris 4 mm. longis apice acutis. *Ovarium* obsoletum, conspicue pilosum. *Flores feminei* deficientes. *Fructus* subsessilis; calyx extra adpresse ferrugineo-pilosus, intus dense ferrugineo-sericeo-pilosus; tubus 2-3 mm. altus; lobi 4, late triangulares, apice obtusi vel subrotundati, 5 mm. lati et longi, margine recurvi; bacca rubra (ex *Kerr*), succulenta, globosa, 1.5-2 cm. diametro, minute apiculata, apice sparse aureo-pilosa, 1-sperma; semina elliptica, 10 mm. longa, 7 mm. diametro, nigra, nitida, albumine radiatim striato.

Ban Den, Kao Sang, c. 100 m., limestone rocks, *Kerr* 4540. Takli, *Put* 2119. Korat, Chantuk, Tachang, c. 400 m., rocky limestone hill, *Kerr* 9987. Korat, Ban Tachang, *Put* 3492. Chantabun, Tamun, c. 200 m., evergreen forest, *Kerr* 9704. Near Sriracha, c. 10 m., *Mrs. D. J. Collins* 1507 (*type*). Chiabadan, Dong Paya Yen, c. 100 m., evergreen forest, *Kerr* 8014. Prachuap, c. 50 m., dry evergreen forest, *Kerr* 21573. Prachuap, Sam Roi Yawt, *Put* 2490. Chumpawn, Siepyuan, *Put* 967. Champawn, Bang Son, *Haniff & Nur* 4233. Lower Siam-Punjab, *Haniff & Nur* 3968.

The collections enumerated represent a species varying rather considerably in hair consistency and permanence and in leaf texture.

***Diospyros scalariformis* Fletcher** [Ebenaceae]; *D. brachiatae* King et Gamble affinis, sed nervis lateralibus paucioribus, pedunculis pedicellisque brevioribus, calyce haud ad basin lobato, corollae lobis minoribus, staminum filamentis longioribus differt.

Arbor circiter 20 m. alta (ex *Kerr*); ramuli teretes vel obtuse quadrangulares, glabri, cortice brunneo paucilenticellato obtecti. *Folia* elliptica vel oblongo-elliptica, apice attenuata, obtusa, basi breviter cuneata, 10-22 cm. longa, 2.5-7 cm. lata, chartacea vel chartaceo-coriacea, utrinque brunnea, glabra, costa supra conspicua subtus prominente, nervis lateralibus 7-10-paribus supra subconspicuis subtus prominulis parallelis intra marginem anastomosantibus, nervis transversis numerosis parallelis scalariformibus subtus subprominulis, reticulatione laxa, margine integra recurva, petiolo 5-8 mm. longo crasso rugoso supra valde canaliculato glabro suffulta. *Flores masculi* in cymis axillaribus dispositi; pedunculi

pedicellique breviter fulvo-pilosi. *Calyx* extra fulvo-pilosus; tubus 2-2.5 mm. altus, intus glaber; lobi 4-5, triangulares, 2.5-3 mm. longi, 2 mm. lati apice acuti, intus sparse pubescentes. *Corolla* alba (ex Kerr), extra aureo-sericeo-pilosa, tubulosa, apice constricta; tubus 10 mm. longus, 4.5 mm. diametro; lobi 5, imbricati, late ovati, 4-4.5 mm. lati, 4 mm. longi, apice rotundati. *Stamina* 18, per paria connata, antheris 2.5 mm. longis apice apiculatis minute aristulatis, filamento communi 1.5 mm. longo, filamentis partialibus 1.5-2 mm. longis. *Ovarium* inchoatum, subglobosum, 1.5 mm. diametro, dense aureo-pilosum.

Surat, Sawng Pi Nawng, c. 200 m., evergreen forest, Kerr 12393.

Diospyros striata Fletcher [Ebenaceae]; *D. dumetorum* W. W. Sm. affinis, sed fructibus striatis semper 6- nec 1-4-spermis differt.

Arbor; ramuli graciles, teretes, primo griseo-pubescentes mox glabrescentes, cortice brunneo vel cinereo-brunneo paucilenticellato obtecti. *Folia* ovata vel sub lanceolata, apice obtusa, basi cuneata, 2-5 cm. longa, 1-2 cm. lata, textura coriacea, utrinque brunnea, pagina superiore adpresse pubescente, inferiore dense fulvo-tomentosa, costa supra leviter impressa subtus prominente, nervis lateralibus 4-paribus supra obscuris vel impressis subtus subconspicuis parallelis intra marginem arcuatim junctis, nervulis paucis supra leviter impressis subtus obscuris, margine integra recurva, petiolo 3 mm. longo dense fulvo-tomentoso suffulta. *Flores* deficientes. *Fructus* subsessiles; calyx usque ad basin 4-partitus, segmentis intus et extra leviter adpresse pilosis ovatis 5-7 mm. longis 3-4 mm. latis apice acutis recurvis; bacca subglobosa, 8-10 mm. diametro, breviter apiculata, leviter fulvo-pilosa vel glabra, 6-striata, 6-loculata, loculis 1-spermis; semina atra, minute rugosa, 8 mm. longa, 4 mm. lata, lateraliter cuneatim compressa, facie distali convexa.

Doi Chiengdao, Put 362.

Although neither male nor female flowers are available, the six grooves on the fruit seem clearly to distinguish this plant from all others.

Diospyros subviridis Fletcher [Ebenaceae]; *D. viridi* Craib affinis, sed corolla calyceque brevioribus, nervis nervulisque utrinque magis prominulis differt.

Arbor circiter 30 m. alta (ex Kerr); ramuli quadrangulares, glabri, cortice cinereo paucilenticellato obtecti. *Folia* lanceolata vel oblongo-lanceolata, apice attenuata, obtusa, basi cuneata, 6-12 cm. longa, 1.5-2.5 cm. lata, chartacea, utrinque brunnea, glabra, costa supra subconspicua vel leviter impressa subtus prominente, nervis lateralibus 12-paribus utrinque prominulis parallelis intra marginem arcuatim junctis, nervis transversis numerosis irregularibus, reticulatione utrinque subprominula, margine integra conspicue recurva, petiolo 7-10 mm. longo supra plano leviter canaliculato glabro rugoso suffulta. *Flores masculi* in cymis axillaribus breviter

pedicellatis vel subsessilibus dispositi; pedunculi 2-6 mm. longi, crassi, glabri. *Calyx* coriaceus, extra glaber vel sparse adpresse pubescens, cupularis, 3.5-4 mm. longus, intus glaber, truncatus vel breviter dentatus. *Corolla* alba (ex *Kerr*), extra glaber; tubus 3.5 mm. longus; lobi 4, rotundati, 4 mm. longi et lati, basi valde imbricati. *Stamina* 30, per paria connata vel in fasciculos triandros disposita, antheris 3-4 mm. longis sessilibus vel subsessilibus. *Ovarium* inchoatum, inconspicuum, glabrum. *Flores feminei* deficientes.

Satul, Kao Keo Range, c. 500 m., evergreen forest, *Kerr* 14572.

***Diospyros trimera* Fletcher** [Ebenaceae]; *D. dumosae* King et Gamble affinis sed nervis lateralibus numerosioribus, pedunculis pedicellisque florum masculorum longioribus, calycis lobis minoribus angustioribus marginibus haud undulatis differt.

Arbor ad 20 m. alta (ex *Kerr*); ramuli graciles, teretes vel obtuse quadrangulares, primo puberuli mox glabri, cortice brunneo vel cinereo-brunneo obtecti. *Folia* elliptica vel oblonda, apice attenuata, obtusa, basi cuneata vel subrotundata, ad 22 cm. longa, ad 7 cm. lata, chartacea, utrinque brunnea vel viridi-brunnea, glabra vel nunc subtus sparse adpresse pubescens, nervis supra leviter impressis, costa subtus prominente, nervis lateralibus 10-12-paribus, subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis subconspicuis parallelis, reticulatione laxa supra obscura, margine integra undulata leviter recurva, petiolo 4-6 cm. longo supra canaliculato leviter piloso suffulta. *Flores masculi* in cymis axillaribus breviter pedicellatis dispositi; pedunculi pedicellisque ferrugineo-pilosi. *Calyx* usque ad basin 3-partitus, segmentis ovatis vel ovato-lanceolatis 2.5-3 mm. longis 2 mm. latis apice acuminatis extra aureo-pilosus intra glabris margine ciliatis. *Corolla* alba (ex *Kerr*); tubus 9 mm. altus, extra basi glaber, superne cinereo- vel fulvo-pubescens; lobi 3, oblongi, 6 mm. longi 4 mm. lati, apice rotundati, intus glabri, extra leviter aureo-pubescentes. *Stamina* 12, per paria connata, breviter aristata, filamento communi ad 0.5 mm. longo, filamentis partialibus 1-2.5 mm. longis. *Ovarium* inchoatum, apice pilis paucis aureis ornatum.

Surat, Yanyao, c. 50 m., evergreen forest, foot of limestone hill, *Kerr* 18197. Puket, Kamala, c. 100 m., by stream in evergreen forest, *Kerr* 17418. Krabi, Tambon Kao Panom, c. 100 m., by stream in evergreen forest, *Kerr* 18654 (*type*).

***Diospyros Winitii* Fletcher** [Ebenaceae]; ab affini *D. Kerrii* Craib foliis pilosioribus, floribus maioribus, staminibus apiculatis differt.

Arbor ad 18 m. alta (ex *Kerr*); ramuli teretes vel quadrangulares, primo ferrugineo-tomentelli, mox glabrescentes, cortice brunneo vel cinereo obtecti. *Folia* leviter ovata vel elliptica, apice acuminata, subacuta, basi rotundata vel subcuneata, 8-15 cm. longa, 3-6 cm. lata, chartacea, supra brunnea vel cinerea, subtus brunnea, pagina

superiore primo ferrugineo-pubescente mox glabra, inferiore ferrugineo-pilosa, costa supra subconspicua subtus prominente, nervis lateralibus 4-6-paribus subtus prominulis parallelis intra marginem arcuatis, nervulis transversis nervulisque obscuris, margine integra juventute conspicue ciliata, petiolo 5-10 mm. longo supra plano indumento ramulorum munito suffulta. *Cymae* ♂ axillares, pauciflorae, pedunculo communi 5 mm. longo indumento simili induto suffultae. *Calycis segmenta* 4, subrotundata, 4 mm. longa et lata, apice acuta, extra ferrugineo-pilosa, intra glabra, valde ciliata. *Corolla* alba (ex *Kerr*), urceolata, extra leviter fulvo-pubescent, intra superne cinereo-pubescent; tubus 6.5-7 mm. longus; lobi 4, ovati vel elliptico-oblongi, 3.5-4 mm. longi, 3 mm. lati, acutiusculi, sub anthesi recurvi. *Stamina* 16, per paria connata, filamentum communo 2-2.5 mm. longo glabro, filamentis partialibus 0.5 mm. longis albo-hirsutis, antheris 2.5-3.5 mm. longis lanceolatis apice apiculatis basi albo-hirsutis. *Ovarium* inchoatum, subglobosum, 2 mm. diametro, apice pilis paucis albis ornatum. *Flores feminei* deficientes. *Fructus* succulentus, globosus, 2-2.5 cm. diametro, 4-loculatus, loculis 1-spermis. *Semina* 13 mm. longa, 7 mm. lata, fabiformia.

Lampang, Hui Pan Chen, c. 210 m., *Winit* 1257. Border of stream, *Winit* 1462. Nan, Nam Pieng, c. 440 m., evergreen forest, *Winit* 1778. Nakawn Tai, c. 200 m., evergreen forest, *Kerr* 5859 (*type*).

XL—THE TAXONOMIC POSITION OF RHYNCHOCALYX. T. A. SPRAGUE and C. R. METCALFE.

The new genus and species described in Hook. Ic. Pl. t. 2348 (1894) by Oliver under the name *Rhynchocalyx lawsonioides* was assigned by him without hesitation to the family Lythraceae. Far from having any doubts as to the family, he thought it necessary to justify the creation of a new genus for its reception: "The isomerous stamens, singly opposed to the petals, and the bilocular compressed ovary with numerous horizontal axile ovules, I think, entirely justify its discrimination as a new generic name. The general facies of the plant is quite that of *Lawsonia inermis*." Koehne, in Engl. Pflanzenr. IV. 216 (Lythraceae), 272 (1903), however, excluded it from the Lythraceae, with the following observations: "Genus a Lythraceis diversum propter stamina 5 vel 6 epipetala exacte cum petalis inserta ovulaque uniseriata horizontalia in ovarii loculamenta utroque. Si loculamenta essent uniovulata, plantam Rhamnaceis adnumerares."

As the result of an enquiry addressed to Kew, the taxonomic position of *Rhynchocalyx* has been re-investigated. Comparison of *Rhynchocalyx* with the descriptions of Lythraceae given in Benth. et Hook. f. Gen. Pl. 1, 773 (1867) and Engl. Pflanzenr. IV. 216, Lythraceae, 2 (1903) show the following points of agreement: Flowers hexamerous. Calyx-tube patelliform; lobes valvate.

Petals unguiculate, crumpled. Disc adnate to the calyx-tube. Filaments incurved. Anthers with a thickened connective, and reniform-recurved after dehiscence. Ovary free; style simple; stigma punctiform. Ovules numerous, horizontal. Leaves opposite, exstipulate, entire. Inflorescence 'paniculate' (*i.e.* cymose).

Koehne excluded *Rhynchocalyx* from the Lythraceae on two grounds: that the stamens are in a single whorl opposite the petals, and the ovules 'uniseriate' in each loculus.

The first ground for exclusion is hardly tenable, since certain undoubted Lythraceae, e.g. *Diplusodon hexander* DC., also have a single whorl of stamens opposite the petals. The sole remaining difference from the Lythraceae, as delimited by Koehne, is the 'uniseriate' arrangement of the ovules. Though the ovules form what superficially appears to be a single vertical row, they are actually *attached* in two perfectly distinct vertical rows. Each ovule (except the lowest) extends horizontally into the space between two ovules of the opposite row, so that all the ovules are almost exactly superposed, the distal half* of each ovule covering the proximal half of an ovule of the other series, and its proximal half covering the distal half of the other ovule.

Lagerstroemia indica has two vertical rows of ovules in each loculus, according to Wight, Ill. 1, t. 86, fig. 7; and in the genus *Cuphea* the total number of ovules is frequently reduced to 3 or 2. The sole peculiarity of *Rhynchocalyx* consists in the ovules of each row growing horizontally between those of the opposite row. Its exclusion from the Lythraceae thus appears to be entirely unjustified, so far as external morphological characters are concerned.

In Koehne's classification *Rhynchocalyx* should be placed in the subtribe *Lagerstroemiinae*, next to *Lawsonia*, with which it agrees, not only in facies, but in a variety of technical characters, including the nature of the anthers. The conspicuously unguiculate, irregularly lacinate petals approach those of certain species of *Lagerstroemia*, the only other genus of *Lagerstroemiinae*.

Anatomy.—There is a general similarity in the stem structure of *Rhynchocalyx lawsonioides* and *Lawsonia inermis*, although really distinctive features indicating a close relationship of the two genera to one another and sharply defining them from other unrelated plants were not observed. There is a solid pith including a few large stone cells in both genera. The distribution of the vessels in the xylem is similar but by no means identical in the two species. The bordered pits in the vessel walls are similar and have horizontal apertures. The short petiole to the leaf in both genera is provided with a single, horse-shoe-shaped vascular strand. Uniseriate, and partly biseriate, heterogeneous rays are also common to both species.

It is not possible to make certain whether internal phloem is present in the herbarium material available, as the phloem cells,

* The expression "distal half" is used for the half of the ovule including the raphe.

being very delicate, are somewhat disorganised in dried material. A small-celled tissue which might represent internal phloem was, however, seen in both genera.

These characters, taken in conjunction with the external morphological similarities seem to indicate that the two genera are closely related to one another.

Rhynchocalyx lawsonioides was collected by John Medley Wood (No. 3124) at the edge of bush near Murchison, Natal, where he found it in flower on April 30, 1884. The species has apparently never been collected again, and the fruit and seeds are still unknown. It is hoped that the publication of this article may lead to its rediscovery.

XLI—THE GENUS OCTOLOBUS WELW. J. HUTCHINSON.

Some genera of *Sterculiaceae* show a curious association of characters, with often a mixture of quite primitive, or at least regarded by many botanists as primitive, and highly advanced types of floral structure. *Octolobus*, a small genus of low trees from the forests of West Africa, falls under this category.

There is at least one very primitive feature, *i.e.*, a large number of quite free carpels spirally arranged. The remainder of the characters are highly advanced. The leaves are unifoliolate, as shown by the presence of a pulvinus at the top of the petiole; the unisexual flowers are solitary and surrounded at the base by an involucre of bracts, indicating reduction from an inflorescence of several flowers; the calyx is gamosepalous and of course valvate as in all *Sterculiaceae* and closely allied families, and it is coloured to compensate for the absence of petals. In addition the stamens are completely united into a column, the anthers being connivent into a ring. The first character, therefore, harks back as far as the *Annonaceae* and *Dilleniaceae*, the remainder reaching the degree of evolution as found in some *Euphorbiaceae*.

The following key should be regarded as tentative until more material of this highly interesting genus is available.

Octolobus Welw. ex Benth. et Hook. f. Gen. Pl. 1, 982 (1867); Welw. in Trans. Linn. Soc. Lond. 27, 17 (1869); K. Schum. in Engl. & Prantl, Pflanzenfam. 3, 6, 43 (1890), et in Engl. Monogr. Afr. Pfl. Sterculiaceae, 99, t. XI (1900).

KEY TO SPECIES OF OCTOLOBUS.

Leaves very abruptly acuminate, rounded at the base and long-petiolate, broadly elliptic to obovate-elliptic

1. *heteromerus*

Leaves gradually to less abruptly acuminate, more or less narrowed to the base, oblanceolate to narrowly obovate:

Leaves glabrous below; petiole glabrous or at most slightly pubescent:

Calyx broadly campanulate from the base, densely and rather roughly stellate-tomentose outside.....2. *spectabilis*

Calyx rather narrowly cylindric in the lower half, suddenly expanded into the limb, shortly and rather laxly stellate-tomentellous outside.....3. *angustatus*
 Leaves densely rusty-villous on the lower part of the midrib and sometimes the lateral nerves below, obovate or obovate-oblong ; petiole densely villous ; imperfectly known species

4. *Zenkeri*

1. ***Octolobus heteromerus*** K. Schum. in Notizbl. Bot. Gart. Berlin, 2, 306 (1899). *O. grandis* Exell in Journ. Bot. 1927, Suppl. 37. CAMEROONS : Bipinde, in shady places of the forest at Lokundje, Dec., *Zenker* 1579 (type).

ANGOLA : Cabinda Distr., *Gossweiler* 6011.

2. ***O. spectabilis*** Welw. in Trans. Linn. Soc. 27, 18, t. 6 (1869) ; Hiern in Cat. Afr. Pl. Welw. 1, 84 (1896).

GABON : Nyanga region, *Le Testu* 1845.

ANGOLA : Cuanza Norte Distr. ; Barranco da Pedra Songoe, Pungo Andonga, ♂ & ♀ fls. Jan., fr. Apr., *Welwitsch* 1202 (type in Brit. Mus. Herb.).

3. ***Octolobus angustatus*** Hutch. sp. nov. affinis *O. spectabili* Welw. sed floribus sub anthesi minoribus, bracteis majoribus rotundato-obovatis, calycis tubo dimidio inferiore cylindrico in lobis 8 subito expanso differt ; ab *O. Zenkeri* Engl., foliis infra glabris distinguitur.

Frutex vel arbor parva usque ad 7 m. alta ; ramuli juniores tomentosi, annotini cinerei, glabrati. *Folia* oblanceolata vel elliptico-obovata, ad basin sensim angustata, late et sensim acuminata, 6–15 cm. longa, 2.5–6 cm. lata, utrinque glabra ; costa utrinque prominens ; nervi laterales utrinsecus 7–9, arcuati, intra marginem conjuncti ; petioli plerumque breves sed interdum ad 3 cm. longi, apice pulvinati ; stipulae subulato-filiformes, mox deciduae. *Flores* ♂ flavi, axillares, sessiles ; bractee subpersistentes, rotundato-obovatae, ad 7 mm. longae, conspicue nervosae et puberulae. *Calyx* 3 cm. longus, extra breviter stellato-tomentellus ; tubus cylindricus, 6–7 mm. diametro, 1 cm. longus, lobis 8 oblongo-lanceolatis marginibus valde undulatis intra crebre puberulis. *Columna staminalis* glabra, stipite 5 mm. longo, antheris 4 mm. longis. *Carpella* juniores numerosa, 5–6-ovulata, tomentosa, stigmatate unilaterale spatulato verruculoso coronato, matura rubra, stipitata, oblique ellipsoidea, 2–2.5 cm. longa, 1.5 cm. lata, sicco minute tomentella et leviter nervosa, stipite 1–1.5 cm. longo. *Semina* 5–6, nigra, nitida.

GOLD COAST : Kwahu Prasu, small tree 20 ft., in undergrowth of closed forest, Feb. 1929, *C. Vigne* 1602 (type in Kew Herb.) ; South Fomang Su Reserve, fls. yellow, *Vigne* 2674 (Oxford For. Herb.) ; Shasha Reserve, small tree or shrub, *Lancaster* 14 (Oxford For. Herb.). Akotui, Eastern Province, Oct., *Vigne* 4028 ; Aketewia, fruits red, with edible black seeds, Nov., *Vigne* 4268.

This closely resembles *O. spectabilis* Welw., the type species of the genus from Angola and Gabon, but the calyx of our plant is more finely tomentellous, and when open and just before opening the tube is rather narrowly cylindric compared with the broadly campanulate tube of *O. spectabilis*.

Vigne states that the Ashanti name is *Afinafi*, the Krobo name *Kobina-nua* and that the wood is hard, heavy and yellow.

4. *O. Zenkeri* Engl. in Engl. Bot. Jahrb. 45, 325 (1911).

CAMEROONS: Bipinde, fr. Mar., *Zenker* 3742 (type).

This is an imperfectly known species, known so far only by the type specimen. It may be at once distinguished by the densely villous petioles and woolly midrib below.

Flowers are much desired to confirm its position in this genus.

XLII—MISCELLANEOUS NOTES.

Retirement of Curator.—The retirement of Mr. John Coutts from the post of Curator on August 31st, 1937, under the age limit, terminates, to our great regret, a period of long and valuable public service at the Royal Botanic Gardens.

Mr. Coutts entered Kew as a student gardener on November 2nd, 1896, and was promoted to the position of Sub-Foreman on October 3rd, 1898. He left Kew on September 15th, 1900, on his appointment as Head Gardener to Sir Thomas Dyke Acland, Bart., at Killerton. Here he spent eight and a half years until he was recalled to Kew to take up the position of Foreman of the Decorative Department, to which he was appointed on March 25th, 1909. The title of the post was changed to that of Assistant Curator in June 1922.

Mr. Coutts was appointed Deputy Curator on May 21st, 1929, and succeeded the late Mr. T. W. Taylor as Curator on March 5th, 1932.

He was made an Associate of Honour of the Royal Horticultural Society in 1930. The Society also awarded him the Victoria Medal of Honour in Horticulture in 1934, and the Veitch Memorial Medal in 1937.

In addition to Mr. Coutts's many contributions to horticultural knowledge and to the valuable assistance he has given both at the great Ghent Floraries exhibition in 1933 and in connexion with the Empire exhibit at the Coronation Chelsea Show of the Royal Horticultural Society this spring, mention must be made of the great interest he has always taken in the welfare of the student gardeners and the encouragement he has given them in their literary and other pursuits. Many generations of Kew men will retain in grateful memory the help and sympathy that they received from Mr. Coutts. In bidding him farewell, we offer to him and to Mrs. Coutts our best wishes for many years of happiness and enjoyment of their well-deserved leisure.

Cocculus grandifolius.—In a paper in Buchner's Repertorium für die Pharmacie, 36 (1830), Martius described three new species of Brazilian *Menispermaceae* which were used in the fabrication of poison by Amazonian Indians, viz. *Cocculus Imene* (p. 341), *C. grandifolius* (p. 345) and *C. amazonum* (p. 349). Of these names only the last is recorded in the Index Kewensis as having been published in this paper (erroneously attributed to Herberger), while no mention is made either of *C. grandifolius* or of *C. amazonum* in Eichler's account in Martius' Flora Brasiliensis, 13, pars 1 (1864), and in Diels' monograph of the family in Engler's Pflanzenreich (1910). *C. Imene* is represented by a type specimen and is the basis of *Abuta Imene* (Mart.) Eichl.

When Martius later produced in "Flora" his long papers of notes on the Brazilian specimens in his herbarium, he assembled descriptions of the Brazilian species of *Cocculus* known to him: see Flora, 24, 2 Beibl. 42-46 (1841). Eleven new species of *Cocculus* were described, among them *C. Imene*, but no mention was made either of *C. grandifolius* or of *C. amazonum*, and no reference was given to the descriptions which had appeared in Buchner's Repertorium. Dr. Harold King, who recently called the writer's attention to this matter, has made enquiries from Prof. L. Diels of Berlin-Dahlem, and the latter writes that he has never seen material of *C. grandifolius* and *C. amazonum*, and that no specimens with these names are to be found in Martius' Herbarium at Munich.

Comparison of the descriptions of *C. grandifolius* and *C. amazonum* with those of species described by Martius in "Flora" fails to identify *C. amazonum* satisfactorily. There can, however, be no doubt about the identity of *C. grandifolius*. The short Latin description in Buchner's Repertorium is incorporated almost word for word in that of *C. laevigata* Mart. (a species with unusually large leaves, 8-10 inches long and 4 inches broad) and corresponds with no other. It is evident that Martius, in describing *C. laevigata*, was elaborating the description of his *C. grandifolius* and substituting a new specific epithet. Now the type of *C. laevigata*, collected in November at Manaqueri near Barra (Manáos), Rio Negro, has been examined by Prof. Diels, who has reduced the species to *Abuta concolor* Poeppig et Endl., of which he has also seen the type material. It therefore becomes evident that, since Martius' description of *Cocculus grandifolius* in 1830 antedates that of *Abuta concolor* by some years, the following new combination is required for this well-known species: ***Abuta grandifolia* (Mart.) Sandw.**, comb. nov.—*Cocculus grandifolius* Mart. in Buchner, Repert. Pharm. 36, 345 (1830). *Abuta concolor* Poepp. et Endl. Nov. Gen. et Sp. 2, 64, t. 188 (1838); Diels, Mon. Menisp., in Engl. Pflanzenreich, 4, 94, p. 197 (1910). *Cocculus laevigata* Mart. in Flora, 24, 2 Beibl. 45 (1841).

N. Y. SANDWICH.

Canadian Woods.*—A number of timbers reach this country from Canada, among the more important being Douglas fir, *Pseudotsuga taxifolia* (Poir.) Britt., western red cedar, *Thuja plicata* D. Don, and yellow cedar, *Chamaecyparis nootkatensis* Sudw., among the softwoods, and basswood, *Tilia glabra* Vent., yellow birch, *Betula lutea* Michx. and rock maple, *Acer saccharum* Marsh., among the hardwoods. In the present work a chapter is devoted to brief descriptions of the commercially valuable timbers of the Dominion, together with lists of the uses to which each is suited. The information given in these short monographs is supplemented by specific data on strength, weight, shrinkage, hardness and other characteristics for each timber, presented in the form of a table in the appendix.

The description of the timbers, however, is but one of the aspects of this many-sided work, the scope of which is indicated by the subjects allotted a chapter. These include the structure of wood, its mechanical and physical properties, decays and stains, preservative treatment, pulp and paper, and the chemical utilisation of wood. In addition, the introductory chapter contains a dictionary of terms used in the lumber industry, and tables in the appendix list safe working stresses for timber columns, beams and joists, weight per lineal foot and other data. The various branches of the work are dealt with individually by experts on the staff of the Forest Products Laboratories of Canada. The treatment is clear but of a rather general type imposed by limitations of space. The liberal and up-to-date bibliography at the end of each chapter indicates sources of more detailed information for those who wish to follow up a special subject. The book is illustrated by photographs and diagrams. It should be of value as a reference work for timber producers and users in this country.

R. MELVILLE.

The Useful Plants of West Tropical Africa.†—In the introduction to the "Flora of West Tropical Africa," which has recently been completed at Kew, the publication of an appendix or economic supplement to deal with economic uses and vernacular names was indicated. This has now appeared. Such a supplement is a new departure in connexion with the publication of a Flora and its compilation was undertaken in the belief that it would furnish a valuable link between botanical research and the work of those who are concerned with the administration, welfare and economic development of the territories concerned.

* "Canadian Woods, their Properties and Uses." By T. A. McElhanney and Associates. Dept. of the Interior, Canada. Ottawa, 1935. Pp. xv + 345. Price \$1.50 bound, \$1 unbound, from the King's Printer, Ottawa.

† By J. M. Dalziel, M.D., B.Sc., F.L.S., late of the West African Medical Service; being an Appendix to the Flora of West Tropical Africa, by J. Hutchinson and J. M. Dalziel. Crown Agents for the Colonies, London, 1937. Pp. 612. Price 18s. net.

Thanks to Dr. Dalziel's long service in the West African Colonies and to his knowledge, not only as a Doctor of Medicine but also as the author of "A Hausa Botanical Vocabulary" and a botanist, he has been able to get together a vast amount of information about the uses made by the natives of their indigenous plants, which should be of great historical and practical value.

It may be thought that much of the ground covered in this Appendix may have been traversed already in Holland's "Useful Plants of Nigeria" (Kew Bulletin, Additional Series 9). This, however, is not the case, for there is no repetition of the information or of the references given by Holland.

A special feature of the work is the large number of vernacular names of plants that are recorded. These, estimated to exceed twenty thousand, occur throughout the text with indications of the country or tribe to which they belong, and are also listed in a separate index. As the author points out, great pains were taken to verify these. Evidence of the labour that has been devoted to this part of the book is afforded by the fact that in the case of the oil-palm not less than a hundred and fifty vernacular names are recorded. In view of the increased interest that has arisen in the study of native languages in West Africa in recent years, these vernacular names will no doubt be regarded by workers in various fields as a valuable feature of the book.

A good deal of native folk lore is to be found within its pages, and popular beliefs and ways of thinking about plants and their influence, real or supposed, on human behaviour and welfare. This is to be expected when it is remembered that so many of the plants referred to have medical uses and much of native medicinal practice cannot easily be separated from magic and superstition.

As much of the area covered by the Flora is French territory it is fortunate that the work of Dr. A. Chevalier, Professor in the Muséum d'histoire naturelle, Paris, and of his collaborators, covering the whole of French West Africa, has been available without reserve.

The serious student will appreciate the references to literature that are given freely in the text and which are additional to the bibliography of major works at the commencement of the volume. The general arrangement of families and species follows that of the Flora, and the three separate indexes—scientific names, common names and vernacular names—should render the work easy of reference to botanists and others alike. Apart from purely indigenous plants many other economic or crop plants that occur or are grown in other parts of the tropics besides West Africa are included. Interest in the work should not therefore be limited to those resident in or associated with West Africa.

Floral Morphology.—What is frequently referred to as the "orthodox" interpretation of flower morphology has been vigorously attacked from several diverse standpoints in recent years. Most morphologists, and, certainly for descriptive purposes, most taxonomists, have accepted a flower as a modified stem (or stem-branch) bearing modified leaves (tepals, stamens, and carpels), whose number and relative position can be determined by the study of "external" morphological features such as independence, number of lobes, number of pollen-sacs, number and position of loculi, placentae, and stigmata, etc. It is also generally agreed that the close aggregation of the floral parts on a short, often very short, and frequently more or less modified receptacle can be correlated with a wide variety of cohesion, adhesion, reduction, branching, and other structural peculiarities, which often, in addition to shape, size, texture, and colour, distinguish floral from vegetative organs. The orthodox theory, especially developed by De Candolle, is very clearly expressed in Asa Gray's *Structural Botany*, vol. 1, chapter 6 (London, 1887). On the whole it has served well as a basis for expressing the very wide range of flower structures which botanists have had to describe, compare, and classify. The stamens and carpels, usually regarded as microsporophylls and megasporophylls, more often than the sepals and petals, sometimes show characters which, taken as a whole, require many modifications of any simple generalized scheme. The gynoecium, in syncarpous flowers at least, must involve the apex of the torus—i.e., on the orthodox view, a stem apex. Recent research and discussions have been particularly concerned with the gynoecium.

For about fifteen years Miss Saunders has made a detailed study of the flower structure, with special reference to the gynoecium, of a wide range of families. The results of her investigations have been published in over 30 papers in some half-a-dozen scientific periodicals. The publication of a summary of her results and interpretations in book form* will be welcomed by a wide circle of botanists, the more so that it is issued in a very acceptable form at a modest price. It should have a wide circulation amongst all who are interested in Angiosperm morphology and systematics, whether as research workers, teachers, or college students.

In an Introduction Miss Saunders explains the general conclusions to which her work has led her. As is generally known, she lays considerable stress on the vascular system of the flower, and especially on the organization of the strands from the central cylinder. Sepals, petals, stamens and carpels, like foliage leaves, ordinarily have a main vascular strand—the midrib. The origin and subsequent arrangement of the strands depends largely on time and space conditions, and the regularity of pattern may be

* "Floral Morphology. A New Outlook with special reference to the Interpretation of the Gynaecium." By E. R. Saunders, F.L.S. Vol. 1. W. Heffer & Sons, Ltd., Cambridge, 1937. Pp. viii + 132. Price 3s. 6d.

more or less masked by the formation of compound bundles (trunk cords) and other disturbances of the normal basic rhythm of alternation.

Partly on the vascular structure of the gynoecium of the many flower types examined, two main kinds of carpels are distinguished: the valve and the consolidated, the latter appearing in two forms, the solid and the expanded (semi-solid and pseudo-valve). Most flowers have both types of carpel in alternating whorls, and even many gynoecea usually described as apocarpous are reinterpreted as syncarpous and composed of two kinds of carpel. The general principles with their implications serve to bring many facts into line. It is claimed that "they dispose of many morphological fictions, including hypothetical splittings and unions, hypothetical suppressed whorls, 'commissural' stigmas, 'false' partitions, 'free-central' placentation and epigyny as traditionally interpreted, while 'parietal' and 'axile' placentation and 'septicidal' dehiscence now have an altered significance. They provide an explanation of obdiplostemony, various forms of fruit dehiscence, and many other hitherto unexplained features."

In the later parts of the book 39 selected families are examined primarily from the standpoint of the problems presented by particular types of floral construction. Under each family a number of illustrative types are named and certain details given concerning them. The descriptive details are, of course, given in terms of the general principles outlined in the first part (Introduction). It is, however, interesting to note that, apart from the accepted polymorphism of the carpels and the important implications of this theory, there is very little that could not have been written by an orthodox morphologist or taxonomist. This is not the place to discuss the pros and cons of the theory of carpel polymorphism and of other still more heterodox theories of flower morphology. Enough has, perhaps, been said to show that Miss Saunders has presented such facts and interpretations as must be taken very fully into consideration by all who have to study that most characteristic Angiospermous structure, the flower.

Miss Saunders's Introduction is not very easy reading. In the volume as a whole the inclusion of more than six figures (that on p. 94 should be fig. 6 and not fig. 5) would have been a boon to many readers. The general absence of figures is of less importance to those who can consult the original papers, to which references are freely given, and of which this book is in many ways a most admirable and convenient partial summary.

W. B. TURRILL.

A New Indian Local Flora.*—Though a good forest Flora of the Punjab has been published by R. N. Parker, a general flora for the Province is still lacking, so that a detailed compilation for the Lahore District is very welcome. Indeed, a large number of such local Floras are needed for the use of students in all branches of botanical knowledge, and but few have yet appeared.

Prof. Kashyap had written the descriptions from *Ranunculaceae* to *Leguminosae* before his untimely death and had also prepared all the drawings. Prof. Joshi was called in to check, revise and complete the remainder, and in a general way he has followed the plan of his predecessor. The volume is useful but it is a pity that it is rather incomplete. Not only have the *Cyperaceae* and *Gramineae* been altogether excluded (a fact that is noted but not explained in the preface), but there are other omissions. For instance, *Frankenia pulverulenta* Linn. has been collected at Lahore, yet this species and, indeed, the family *Frankeniaceae*, are omitted. Again *Carissa Carandas* Linn. is at least cultivated in Lahore (vide Parker) but is not included. These omissions emphasize the fact that it is well nigh impossible to compile a complete flora without prolonged access to a large herbarium.

The authors have only partially accepted modern developments in nomenclature and taxonomy. Thus, though the division of the old family *Leguminosae* into three has been adopted, separation of the *Aponogetonaceae* and *Potamogetonaceae* from the *Najadaceae* has been rejected.

Cocculus Laeaba DC. is retained though it has been shown that the correct name is *C. pendulus* (Forsk.) Diels, and it so appears in Gamble's "Flora of the Presidency of Madras"; *Tamarix gallica* Linn., which is cited, does not, however, occur in India, the plant going under that name in Indian Floras being a distinct species, *T. Troupii* Hole (Indian Forester, 1919); while *Melia Azadirachta* Linn. is now accepted as forming a distinct genus as *Azadirachta indica* A. Juss.

It is unfortunate that it is not always indicated whether a species listed is truly indigenous, run wild or cultivated. It should, for instance, have been stated that the three species of *Opuntia* cited are introductions which have more or less run wild. A key to the families would be a welcome addition.

With the exception of the incompleteness referred to above, these blemishes are of minor importance and are cited here only in anticipation of a revised edition.

The book starts with a synopsis of the families and ends with a glossary of botanical terms and an index of families, genera and vernacular names. Keys to the genera and species are provided

* "Lahore District Flora." By the late Professor Shiv Ram Kashyap, D.Sc., revised and completed by Amar Chand Joshi, M.Sc., with foreword by Haraprasad Chaudhuri. Published by the University of Punjab, Lahore, 1936. Pp. iv+285, 218 text figs. Price Rs. 6-8-0.

and there are brief descriptions of the families and genera and many of the species. The print and style is good and neat, though rather small, and the text figures facilitate recognition of the plants depicted.

The work undoubtedly fills a want and it is to be hoped that a revised edition remedying the defects noted will soon be called for.

C. E. C. FISCHER.

Mexican Cacti.*—A great deal of work on the *Cactaceae*, mostly concerned with special areas, has been published since the appearance of the standard monograph by Britton and Rose in 1919–1923. In every case the classification has been based on that of Britton and Rose, and their descriptions and illustrations have been accepted as typifying the species concerned. The present work is no exception, but the author has endeavoured to follow the International Rules for the nomenclature, and such names as *Neomammillaria* Britt. et Rose, still adopted by some authors, are accordingly rejected in favour of those prescribed by the Rules.

The systematic treatment (pp. 71–720) closely follows that of Britton and Rose, and the keys are extracted from their work with such modifications as are required. This part is especially valuable, being based largely on studies in the field. It is illustrated by 300 figures in the text, most of which are reproduced from photographs of the plants in their native habitats. A few of these are poor, but the majority are clearer than is usual in such text-figures, and should prove of great value in the identification of species. Very few new species are included, and these are unfortunately unaccompanied by Latin diagnoses.

Nearly 700 species, representing 61 genera, are enumerated and described. Of these *Mammillaria* accounts for 203 species (13 doubtful), *Opuntia* for 100, *Coryphantha* for 51 and *Echinocereus* for 48, whilst 21 genera are represented by a single species. Of the remaining genera, only 6 exceed 10 species.

The preliminary chapters (pp. 1–70) deal with historical data, geographical distribution, general morphology, anatomy and economic value, and are illustrated by 25 text-figures. An exhaustive bibliography and index (pp. 723–755) are appended.

The book is produced on thin chalky paper, and the ink has not adhered very well in the large roman type used for the general text and descriptions, which is therefore somewhat “spidery” and difficult to read. The smaller roman type used in the keys, and the italic type used for synonyms and subheadings, are much better.

A. A. BULLOCK.

*“Las Cactaceas de Mexico.” By Helia Bravo H, Inst. Biol. Mexico, 1937. Pp. xiv + 755 + 325 figs. in the text. Price not stated.

Bibliography of Polynesian Botany.—In 1924 Dr. Merrill published a "Bibliography of Polynesian Botany" as Bulletin 13 issued by the Bernice P. Bishop Museum, Honolulu. He has now prepared a second edition*, containing approximately twice as many references and brought up to date to 1935. Notes are added under each title to give an idea of the nature of the contents and care has been taken to obtain consistency in citation and accuracy in the dating of the references. Every endeavour has been made to include all references to Polynesian plants even in general papers which deal with plants from many other countries. The region covered includes most of the islands in the Pacific Ocean but naturally excludes groups which are commonly treated as distinct geographical areas, e.g., Malaya, New Guinea and adjacent island groups, New Zealand, etc. The bibliography may be confidently recommended as providing a practically complete reference to all papers dealing with the taxonomy, phytogeography, ecology and pathology of Polynesian plants, as well as many references to such applied branches as forestry, economic botany, etc. In all some 2,600 titles are mentioned.

Indian Arboriculture.†—This volume is a revision from the pages of the "Journal of the Bombay Natural History Society" with considerable additions. Fifty-three species of trees, some of them introduced into India from other lands, are described. Thirty-one of them are illustrated by beautiful coloured plates; in addition there are 35 full-plate photographs and 42 line drawings in the text, the latter presenting details of leaves or floral parts. The work is intended primarily for the lover of trees and flowers as such, and only secondarily for the botanist, and the descriptions are as untechnical as possible. With the book in hand, no one, however little his botanical knowledge, should have any difficulty in identifying the species mentioned.

A full description of the species is given under the English name, followed by the botanical one; then are stated the distribution, uses and popular beliefs associated with them, ending with an exhaustive list of popular names in many languages. In most cases the derivation of the botanical name is explained. For the genera *Bombax*, *Cassia* and *Erythrina*, each of which is represented by several species, an easy key to assist identification has been provided. The coloured plates, which are by several artists, leave nothing to be

* "Polynesian Botanical Bibliography, 1773-1935." By E. D. Merrill. Bernice P. Bishop Museum, Honolulu, Hawaii, Bulletin No. 144, pp. 1-194 (1937). Price \$3.

† "Some Beautiful Indian Trees." By the late Rev. E. Blatter and W. S. Millard. Published by the Bombay Natural History Society. Printed by John Bale, Sons & Curnow, Ltd., London, 1937. Pp. x + 110, 31 coloured plates, many photographs and text drawings. Price 21s.

desired, and the whole work is excellently produced and is highly creditable to all those responsible for it.

C. E. C. FISCHER.

Leguminous Forage Plants.*—The chief object of this book, as stated in the preface, is “to enable interested persons to recognise the more important leguminous plants grown on the farm [in the British Isles], both in the seedling and in the mature stage.” It is intended mainly for students at agricultural colleges and institutes, but the hope is expressed that it will be found useful by advisory officers, county organisers and others interested in farm crops. General accounts are given of over two dozen species of forage plants, with a good deal of useful information, particularly in connection with cultivation and pasture value. Two of the seven chapters in the book are devoted to the true clovers (*Trifolium* spp.). Other chapters are entitled—The Medics (*Medicago*), Other pasture plants (*Lotus*, *Anthyllis*), Plants grown as field crops (*Onobrychis*, *Lupinus*, *Melilotus*), Pulse crops grown for fodder (*Vicia*, *Pisum*, *Glycine*). Simple sketches of flowers, leaves, seedlings, seeds, etc., intended to assist the reader in identifying the plants, appear in the text.

As the book is intended primarily to assist in identification it is regrettable that a simple key based on morphological characters was not included. Such a key would not be difficult to prepare as the number of species is restricted and several are very distinctive. Furthermore it could have been drawn up so as to be readily usable by the ordinary reader, without assuming much previous botanical knowledge. It is doubtful whether additional technical terms to those already in the glossary would have been needed. With the book in its present form the reader with a plant to identify is obliged to go through the book page by page until he recognizes his plant. This may involve looking through the whole book and is unnecessarily cumbersome. The definitions of scientific terms in the glossary are not always clear or well chosen. The following are examples: “calyx—the green leaves at the base of a flower”: “raceme—a type of inflorescence in which the flowers are arranged spirally on an axis, each with its own stalk.”

In the preface the author apologises for the use of technical terms, which he refers to as “jargon.” It is unusual for those engaged in scientific work to refer to the technical terms necessary for or peculiar to their particular science in this derogatory manner.

The chemical analyses that accompany the descriptions are a useful feature of the book and a good criterion of feeding value, particularly as figures in some instances are for various stages in the plant's growth and for hay.

* By D. H. Robinson, Ph.D., B.Sc., N.D.A., Head of the Biology Dept., Harper Adams Agricultural College, Newport, Shropshire. Edward Arnold and Co., London, 1937. Pp. 119. Price 6s. net.

In discussing forage lupins the writer states that the innocuous forms of recent Continental origin have not yet been tried in this country. As preliminary trials were commenced in at least one locality last year this statement requires modification. Under tares (*Vicia sativa*) mention might have been made of the possible poisonous nature of the seeds of this species if fed to stock. In recent years several cases of poisoning of live-stock, particularly pigs, have occurred through the feeding of so-called "Chilean peas" (*Vicia sativa*). Little attention appears to be paid by the writer to the importance of leguminous forage plants in honey production. In many areas white clover (*Trifolium repens*) and sainfoin (*Onobrychis sativa*) are the mainstays of commercial honey producers. In fact white clover has been described as the world's most important honey plant, being responsible for large yields in both North American and European countries. F. N. HOWES.

Notes on Poupartia and Allied Genera.—In a paper recently published in the "Annals of Botany" on the method of germination of seeds enclosed in a stony endocarp*, the fruit structure of three species previously referred to the genus *Poupartia* Commerson (Anacardiaceae-Spondieae) was described. As that paper was largely concerned with the morphology of the fruits it seems advisable to give a separate and amplified account of the taxonomic results.

In a recent revision of *Poupartia*, Mattick† recognized 8 species, of which 5, including the type-species *P. borbonica*, come from the Mascarene Islands or Madagascar. All these 5 species are uncommon and herbarium material is scanty, but they appear to form a natural genus which is characterized by its flowers being borne singly or in small clusters on an unbranched axis and by its small 1 (–5?)-locular fruits with a woody endocarp from which the radicle evidently escapes by pushing off a definite cap, which may be seen placed laterally at the apex of the fruit. In *P. gummifera* Sprague and in an unnamed specimen from Aldabra the seed is curved in the shape of a horse-shoe within the fruit which consequently in transverse section appears at first sight to be bilocular—but in *P. borbonica* Gmel. ex Poir. and *P. pubescens* (Boj.) March. ex Engl., the seed is only slightly curved. Further specimens are required before the value of these points can be ascertained.

One of the species retained in *Poupartia* by Mattick is native in Brazil, namely *P. amazonica* Ducke. It clearly belongs to a different genus for it has a big, top-shaped, 5-locular fruit (see Ann. Bot. l.c. fig. 11, n. 6). It cannot be placed in any of the American genera, but it agrees well, both in flower and in fruit, with the African genus *Antrocaryon* Pierre, to which it was accordingly transferred as *A. amazonicum* (Ducke) B. L. Burtt et A. W. Hill (Ann. Bot. l.c.

* A. W. Hill in Annals of Botany, new series, 1, 239 (1937).

† F. Mattick in Notizbl. Bot. Gart. u. Mus. Berlin, 12, 678 (1935).

p. 251). The genus is now known from Uganda, Cameroons, Nigeria, Gold Coast and Brazil.

One of the two Asiatic species, *Poupartia chinensis* Merrill, is identical with *Spondias lakonensis* Pierre, which Stapf* made the type of a distinct genus, *Allospondias*. It differs from both *Poupartia* and *Spondias* in its peculiar fruit-structure (see Ann. Bot. l.c. 252, fig. 13), but agrees with the latter in having valvate petals.

The third species to be excluded from *Poupartia* is *P. axillaris* (Roxb.) King et Prain (*P. Fordii* Hemsl.), which we have made into a distinct genus *Choerospondias*. A diagnosis was given in the Annals of Botany; a description including floral characters and references are now supplied.

Choerospondias *B. L. Burtt et A. W. Hill* in Annals of Botany, new series, **1**, 254 (1937); *Spondiadi et Poupartiae* affinis, ab illa petalis imbricatis, putamine osseo (nec fibroso), nervo intramarginali foliorum deficiente, ab hac floribus, foemineis solitariis vel subsolitariis, masculis et pseudohermaphroditis paniculatis, numquam in inflorescentias simplices spiciformes dispositis, fructu drupaceo putamine osseo ex endocarpio et mesocarpii parte interiore constante differt.

Arbor. Folia imparipinnata, foliolis 7–15 integris nervis lateralibus patulis in nervum intramarginalem haud coniunctis. *Flores* polygamo-dioici; ♂ paniculati; ♀ axillares, solitarii vel subsolitarii; pseudohermaphroditi in inflorescentias 3-pluri-floras dispositi, steriles. *Calyx* cupularis, obtuse 5-lobatus. *Petala* 5, libera, imbricata. *Stamina* 10, filamentis basi inter se et cum disco 10-lobato, lobis filamentis alternatis, coalitis. *Ovarium* superius, ovoideum, 5-loculare. *Style* 5, liberi, sublaterales, stigmatibus capitatis. *Ovula* in loculis solitaria, pendula. *Fructus* ovoideus, drupaceus, putamine osseo 5-loculari apice poris 5 membrana obtectis praedito. *Semina* intra loculos putaminis in capsulis duris, ut videtur e parietibus loculi compositis, inclusa.

Choerospondias axillaris (Roxb.) *B. L. Burtt et A. W. Hill*, l.c.

Spondias axillaris Roxb. Cat. Hort. Beng. **34** (1814), nomen; Fl. Indica (ed. Carey), **2**, 453 (1832), descr.; Hook. fil. Fl. Brit. Ind. **2**, 42 (1876); Gamble, Man. Ind. Timb. ed. **2**, 223 (1903); King et Prain in Ann. Roy. Bot. Gard. Calcutta, **9**, pt. **1**, 18, t. 25 (1906); Brandis, Ind. Trees, 201 (1906); Wilson, Veg. West. China (Publ. Arn. Arb. **2**) 476 (1911); Arn. Arb. Exped. China, 1910–1911, 245 (1912); Naturalist in West. China, **172**, 229 (1913); Rehder & Wilson in Sargent, Pl. Wils. **2**, 172 (1914); Hu et Chun, Icon. Pl. Sin. **1**, t. 33 (1927). *Poupartia Fordii* Hemsl. in Hook. Icon. Pl. t. 2557 (1898); Dunn et Tutchet in Kew Bull. add. ser. **10**, 69 (1912). *Poupartia axillaris* (Roxb.) King et Prain in Ann. Roy. Bot. Gard.

* Stapf in Hooker's Icones Plantarum, t. 2667 (1900).

Calcutta, 9, pt. 1, 20 (1906) ; Mattick in Notizbl. Bot. Gart. u. Mus. Berlin, 12, 682 (1935).

var. *pubinervis* (Rehd. et Wils.) B. L. Burtt et A. W. Hill, comb. nov. *Spondias axillaris* var. *pubinervis* Rehd. et Wils. in Sarg. Pl. Wils. 2, 173 (1914). *Poupartia axillaris* var. *pubinervis* (Rehd. et Wils.) Mattick in Notizbl. Bot. Gart. u. Mus. Berlin, 12, 683 (1935).

The variety differs only in the softly pubescent nerves of the lower leaf surface.

Choerospondias is now known from Sikkim, Assam, S. China (Szechwan-Kwantung) and Siam : the range is given in detail by Mattick (l.c.).

A. W. HILL and B. L. BURTT.

A Monograph on the genus *Heuchera*.*—This important study of a natural genus well-known in horticulture is the outcome of thirty years' consideration on the part of the senior author, who had published a synoptical revision in 1905. Fifty-one species in five sections are now recognised, an estimate lying about half-way between that of Rydberg in the North American Flora in 1905 (72 species) and that of Rosendahl himself in the same year (27 species). The introduction includes many interesting remarks on phylogeny, hybridity and the relationships of the sections. It is pointed out that the majority of the species are probably self-sterile, a fact accounting for much hybridisation in nature as well as in cultivation. This offers a reasonable explanation of the numerous wild "intergrade" forms between certain species. The authors' criteria for their taxonomic treatment of intergrading entities will be read with interest by other workers who are studying genera on similar lines. It is a pleasure to record the publication of yet another careful revision, based on field-work, herbarium study and cultural experiments, of a herbaceous North American genus.

N. Y. SANDWITH.

* By Carl Otto Rosendahl, Frederick K. Butters and Olga Lakela. Minneapolis. The University of Minnesota Press, 1936 (Minnesota Studies in Plant Science, vol. 2). Pp. 180. Price 13s. 6d. net.

BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1937 ROYAL BOTANIC GARDENS, KEW

XLIII—A NOTE ON THE HORNED POPPY IN NEW ZEALAND. H. H. ALLAN (Plant Research Station, Palmerston North, New Zealand).

The horned poppy, *Glaucium flavum*, was first recorded for New Zealand in 1878 by Kirk ("On the Naturalized Plants of Port Nicholson and the adjacent District," Trans. N.Z. Inst. **10**, 362-378), as "widely diffused on shingly beaches" at Port Nicholson, "supposed to have been introduced in the packing material for the patent slip machinery." Work was commenced on the harbour front towards the end of 1865, but I have not been able to find evidence that the connexion between the patent slip machinery and the introduction of the horned poppy is more than a surmise. The present distribution, as given by Cheeseman (Manual of the New Zealand Flora, ed. 2, p. 1065: 1925) is "Sandy or shingly beaches from Wanganui and Hawkes Bay to Wellington. Near the mouth of the Awatea River, Cockayne; vicinity of Ashburton, H. W. Smith; Puketeraki (Otago), G. M. Thomson." I have been able to study only the population at Port Nicholson.

Turrill ("A Study of Variation in *Glaucium flavum*," Kew Bull. 1933, 174-184) gives a valuable account of the taxonomic history, relationships and variations of the species. For the British Isles he states that *G. flavum* in luxuriance of development is rather readily modified by environmental factors. The variations are discussed, and Kuntze's action in uniting all forms of *Glaucium* known to him under one specific name is rejected. "That petal-colours, types of capsule indumentum, types of indumentum of vegetative parts, size of flowers, and shapes of leaves do show a degree of independent variation is true, though the linkage of characters is rather greater than Kuntze admits. When, however, we find as we do, that certain characteristic combinations are constant, except for a few exceptions usually explicable by alien introduction, for geographical regions or definite (ecological) habitats, we have to review Kuntze's conclusions with the aid of facts he ignored."

The polymorphy in *Glaucium flavum* from different sources is analysed by the aid of a formular treatment, and the conclusion drawn that *G. leiocarpum*, *G. Serpieri*, *G. fulvum*, and *G. tricolor* represent certain combinations of characters which occur also in other combinations and which show no clearly marked geographical

or ecological isolation." It is further concluded that *G. flavum* in this wide sense "is most polymorphic in the Eastern Mediterranean Region, and especially in the Balkan Peninsula, that it spread westward and in doing so *G. flavum* sensu stricto (*Chelidonium Glaucium* L.) segregated out. . . . Eastwards from the Balkan Peninsula a selection, apparently less complete, has tended to the predominance of shorter, more slender, glabrous fruits and darker flowers."

Glaucium flavum now occurs in abundance along the outer shores of Miramar Peninsula on the gravelly and sandy beaches a little above high-water mark. Occasionally plants occur on more rocky ground or in the lower parts of the grassy vegetation a little above the coastal strip, and along the roadsides. During the past six months (October 1936–March 1937) I have made a detailed study of the populations occurring between Point Dorset and Island Bay, a distance of some 10 km., examining hundreds of plants, and actually scoring 250. The outstanding result is the constancy of *Glaucium flavum* in that area. Of course there are differences in stature according to habitat conditions, but in essentials one plant is exactly like another. Using Turrill's scheme, we get the following expression of the Wellington form:

Stem: glabrous, except that in the younger stages a *very* few hairs are always to be found near the lower cauline leaves, which may or may not persist in the adult stage. S.2.

Cauline leaves: rather densely bristly on the upper surface, and rather deeply lobed. L.1.4.

Flower stalk: glabrous. P.2.

Sepals: rather sparsely bristly, but constantly so. K.1.

Petals: \pm 3.7 cm. long, never less than 3 cm.; pale yellow, with a definite but slight basal blotch, sometimes deepening on drying. C.2.3.5.

Ovaries and young fruits: rough. G.1.

Fruits: more than 20 cm. long, more than 4 mm. broad, not contorted, not constricted between the seeds. F.2.4.6.8. (Of only a few of the plants used for these measurements am I certain that they were the same as used for the other data.)

The formula for each one of the 250 scored, thus reads: S.2. L.1.4. P.2. K.1. C.2.3.5. G.1. F.2.4.6.8. Nor was any plant noted differing from this. This formula agrees largely with one given by Turrill for Hurst Castle, Hants, and that for Caneé, Crete (differing only in the larger flowers, and the presence of a basal blotch). But Turrill does not give any exact measurements, and this slight difference in petal-length may not be very significant. In any case the form comes into *G. flavum* in Turrill's stricter sense. Particular attention was paid to plants of different ages, and it became clear that for this species, at Wellington, there is no polymorphy in the genetic sense, but a constant jordanon, or whatever one likes to call it, is present. Seedlings, too, showed no sign

of any segregation of characters. The constancy of flower colour is in striking contrast with the polymorphy shown in New Zealand by *Eschscholtzia californica* and *Lupinus arboreus*, where one seldom finds a population all of one flower colour. Turrill's promising line of investigation seems very well worth following up, as he suggests, "over a wide range of species and genera."

Dr. Allan's interesting account of *Glaucium flavum* in a New Zealand habitat shows clearly the value of studies of plant populations and the arrangement of the data obtained in such a manner that comparisons can easily be made with other populations. The result of Allan's scorings suggests that there has been only one introduction of *G. flavum* to the Port Nicholson habitat, and that, very probably, from a British locality. Though the possibility of selection of one genotype ("constant jordanon, or whatever one likes to call it") cannot be ignored.

Since the paper on *Glaucium flavum* was published in 1933, some cultural and additional field studies have been made. These have not yet been completed but on the whole they support the scheme proposed in the above paper. It is interesting to note that the New Zealand material has the sepals "rather sparsely bristly, but constantly so." E. Mediterranean material, from the Athos Peninsula, grown in the Herbarium Ground at Kew, has varied very greatly in this character, even for different flowers on the one plant. In the examples given in K.B. 1933, 182-3, the first four should read K 1, not K 2. All British specimens seen have, as stated in the text, more or less bristly sepals.

The symbolic scheme suggested in K.B. 1933, 182, does not include certain variations which a preliminary survey of a large number of specimens appeared to indicate were of very minor importance for the purposes then in view. One advantage of such a scheme, however, is its flexibility. Unlike systems of nomenclature based on type specimens, it can be modified according to both aims and experience, as well as to enable available data to be utilized to the full. Allan's agreement that the scheme is worth following up is encouraging, and it is hoped that his contribution will draw further attention to it. More constructive criticism based on real experience and unbiassed testing is needed.

W. B. TURRILL.

XLIV—TROPICAL AFRICAN PLANTS: XVII*.

Cistanthera parvifolia M. B. Moss, sp. nov. [Tiliaceae]; a *C. Holtzii* Engl. foliis multo minoribus angustioribus, petiolis multo gracilioribus, petiolis pedicellisque pilis minutis stellatis dense praeditis et hirsutis differt. Trees and Shrubs of Kenya Colony 41 (1936).

* Continued from Kew Bull. 1937, 341.

Arbor. *Ramuli* cortice cinereo transverse fissio obtecti, novelli pilis minutis stellatis dense praediti et hirsuti. *Folia* subcoriacea, oblonga vel oblongo-lanceolata, vix acuminata, apice obtusa breviter mucronulata, basi rotundata, 2-4 cm. longa, 1-1.6 cm. lata, margine integra vel obscure undulata, supra glabra costa puberula, subtus minutissime stellato-puberula; costa supra sulcata, subtus prominula; nervi laterales utrinsecus 6-7, inconspicui; petiolus tenuis, 6-10 mm. longus, breviter stellato-pubescentis et hirsutus; stipulae minutae, caducae. *Cymae* breves, 1-2-florae, ex axillis foliorum apicem versus ramulorum ortae; pedunculi 6-8 mm. longi, ut pedicelli breviter stellato-pubescentes et hirsuti; pedicelli pedunculis breviores, infra calycem articulati; bractaeae et bracteolae mox deciduae; alabastra ellipsoidea, circiter 8 mm. longa, breviter stellato-pubescentia. *Sepala* libera, oblongo-lanceolata, 8 mm. longa, 2.5 mm. lata, patentia vel reflexa, extra breviter stellato-pubescentia, intus parce puberula. *Petala* oblonga, circiter 8 mm. longa, 2 mm. lata, glabra. *Stamina* 10, per paria inaequalia petalis plus minusve opposita, filamentis vix 1 mm. longis cohaerentibus; antherae 3-4 mm. longae; staminodia 5, cum paribus staminum alternantia, lineari-lanceolata, 6-7 mm. longa. *Ovarium* plus minusve globosum, circiter 2 mm. diametro, minutissime pubescens; stylus circiter 1 mm. longus; stigma carnosum, lobis 2 mm. longis instructum. *Fructus* ignotus.

KENYA COLONY. In forest, Arabuko, June 1929, R. M. Graham (For. Dep. 1994):—fair-sized tree; bark rough, dark coloured; flowers white, scented; fruits small black; native names *Mrunza* (Kiswahili), *Papan* (Kisanya), *Muheru* (Kiswahili-Lamu).

Specimens of *C. parvifolia* M. B. Moss were sent to the Botanical Garden and Museum at Berlin for comparison with the type specimen of *C. Holtzii* Engl., the only representative of the genus hitherto known from East Africa. We are very grateful to Prof. M. Burret, who compared the two species and who reported that he considered *C. parvifolia* distinct from *C. Holtzii*. The differential diagnosis here given is based on Prof. Burret's report. An interesting feature of *C. parvifolia* is that the stamens are joined together by their filaments in unequal pairs. This character is not shown in the drawing of *C. Holtzii* in Engler, Botanische Jahrbücher 39, 578 (1907), nor is it mentioned in the generic description on the previous page.

E. MILNE-REDHEAD.

Erythroxylum Fischeri Engl. Pflanzenw. Ost-Afr. C, 226 (1895) [Erythroxylaceae]; O. E. Schulz in Engl. Pflanzenr. Erythroxylaceae 4, 134, 154 (1907). *Amanoa Schweinfurthii* Bak. & Hutch. in Bull. Misc. Inform. Kew 1910, 56 (1910), synonym. nov.; Hutch. in Dyer Fl. Trop. Afr. 6, 630 (1912); Pax in Engl. Pflanzenr. Euphorbiaceae 4, 147, XV, 200 (1922); Pax & Hoffm. in Engl. Pflanzenfam., ed. 2, 19c, 70 (1931).

The type number of *Amanoa Schweinfurthii* Bak. & Hutch. is cited by Schulz (l.c.) under *Erythroxylum Fischeri* Engl. and the type specimen undoubtedly belongs to that genus. E. A. BRUCE.

Euphorbia erantes R. A. Dyer et Milne-Redhead, sp. nov. [Euphorbiaceae] ; ab *E. Ledermanniana* Pax & K. Hoffm. foliis brevissimis deltoideis (haud lineari-lanceolatis), ovario breviter stipitato inclusio differt.

Herba perennis, glabra, radice tuberoso. *Tuber* plus minusve sphericum, 3-4 cm. diametro, radicibus paucis tenuis instructum. *Caudex* perennis, lignosus, subterraneus, simplex, erectus, circiter 2.5 cm. longus, usque 1 cm. diametro. *Caules* annui, carnosii, glauci, 1-2 ex apice caudicis exorti, circiter 8 cm. alti, sub anthesin simplices, demum verosimiliter ramos foliosos gerentes. *Folia* caulium floriferorum alterna sessilia, amplexicaulia, deltoide, acuta, circiter 10 mm. longa, 5 mm. lata, leviter carnosia, glauca, mox decidua; folia inflorescentiae deltoideo-ovata, acuta, circiter 8 mm. longa et lata, leviter carnosia, glauca. *Cymae* umbelliformes, ramis 2-3 usque 2.5 cm. longis, quoque ramulo cyathia singula vel bina gerente, cyathio basali interdum haud evoluta. *Cyathia* omnia ♀, cupuliformia vel campanulata, circiter 6-7 mm. diametro, glandulis 5 et lobis 5 fimbriatis instructa. *Glandulae* disjunctae, transverse oblongae, breviter lateque stipitatae, circiter 3 mm. latae, margine crenulatae. *Ovarium* subglobosum, breviter stipitatum; styli 3, in toto 2 mm. longi, apice plus minusve bifidi, basin versus in columnam 0.5 mm. longam connati. *Capsula* erecta, trilobata, circiter 1 cm. diametro, 1 cm. alta; semina late ovoidea, leviter 3-angularia, circiter 4 mm. alta, et 4 mm. diametro, brunnea, irregulariter elevato-alveolata.

NORTHERN RHODESIA. Solwezi District. On dry burnt ground in dambo at Solwezi, 20 Sept. 1930, *Milne-Redhead* 1158:—perennial with tuberous rootstock; stems rather succulent, glaucous, about 8 cm. high; bracts sub-similar to the reduced leaves, glaucous, pinkish; foliage shoots not developed when in flower and fruit.

Phyllanthus Grahamii Hutch. et M. B. Moss, sp. nov. [Euphorbiaceae]; affinis *P. Welwitschiano* Muell. Arg., sed foliis basi cuneatis haud cordatis, pedicellis brevibus, stigmatibus patentibus differt. Trees and Shrubs of Kenya Colony 49 (1936).

Frutex parvus, ramosus, usque 3 m. altus (? dioecus); rami purpureo-brunnei, cortice demum angustato-longitudinaliter denu-
dati; ramuli hinc inde papilloso-puberuli, ceterum glabrescentes. *Folia* stipulata; stipulae plus minusve persistentes, subulato-triangularis, 4 mm. longae, basi 1 mm. latae, apice filiformes, plerumque brunneo-ciliatae; petiolus 1-1.5 mm. longus, supra tenuiter sulcatus, papilloso-puberulus; lamina oblongo-elliptica vel anguste obovata, glabra, apice rotundata, basi late cuneata, 2-5 cm. longa, 1-2 cm. lata, subtus pallidior, margine revoluta;

nervi laterales utrinsecus circiter 11, prominuli, patentes, reticulati. *Bractae* multae, rufae, in axillis foliorum cum floribus immaturis congestae, quadratae vel lanceolatae, marginibus filiformi-laciniaetae. *Flores* ♂ plerumque solitarii, ex axillis foliorum orti; pedicelli 3-5 mm. longi, glabri; tepala 3+3, late elliptica, apice rotundata vel truncata, circiter 3 mm. longa, glabra; disci glandulae 6, contiguae, hippocrepidiformes, crassae, 0.7 mm. longae; stamina 3, filamentis connatis 2 mm. longis. *Flores* ♀ 1-2 ex axillis foliorum orti; pedicelli 2-4 mm. longi, glabri; tepala 3 + 3, late elliptica vel suborbiculata, apice rotundata vel subtruncata, 3 mm. longa, glabra, valde venosa; discus crassus, undulato-annularis; ovarium sessile, glabrum, 3-lobatum, subglobosum, stylis connatis 0.7 mm. longis; stigmata 3, patentia, crassa, ambitu triangularia, apice leviter vel valde furcata, circiter 1 mm. longa.

KENYA COLONY. Arabuko, in forest undergrowth, 1927, *R. M. Graham* (For. Dep. 1986) (type):—small shrub 3 m. high; flowers whitish; native name *Mkwamba-vitu*. Common shrub in Arabuko, Sokoke forest and in bush on old cultivated land, Aug. 1932, *MacNaughtan* 184 (For. Dep. 2869):—flowers white and faintly scented.

TANGANYIKA TERRITORY. Tukuyu [Rungwe] District. Kilambo, Masoko, 1 Aug. 1912, *Stolz* 1404:—shrub 1.5 m. high, fruits greyish-red.

ZANZIBAR. Babay, July 1894, *Sacleux* 2100.

Phyllanthus holostylus *Milne-Redhead*, sp. nov. [Euphorbiaceae]; a *P. suffrutescenti* Pax foliis subacutis, stylis omnino liberis apice integris differt, et a *P. Friesii* Hutch. foliis latioribus, stylis haud connatis recedit.

Herba perennis, rhizomate lignoso interdum repente. *Caules* multi, erecti, aliquanto congesti, 8-10 cm. longi, leviter furcati, paulo complanati, glabri, plus minusve purpureo-glaucoscentes. *Folia* ovato-lanceolata vel lanceolata, apice subacuta, minute apiculata, basi rotundata, subsessilia, usque 12 mm. longa, 4 mm. lata, integra, coriacea, nervis valde inconspicuis, glabra, glaucoviridia; stipulae parvae, triangulares, vix subulatae, scariosae. *Flores* ♂ solitarii vel 2-3 in axillis foliorum fasciculati:—*Pedicelli* circiter 2 mm. longi, tenuissimi, glabri. *Sepala* 6, elliptico-oblonga, obtusa, circiter 3 mm. longa, 1 mm. lata. *Glandulae* disci 6, contiguae, glabrae. *Stamina* 3; filamenta usque ad apicem connata, 1.5 mm. longa; antherae circiter 1 mm. longae. *Flores* ♀ in axillis foliorum solitarii:—*Pedicelli* sub anthesin circiter 3 mm. longi, apicem versus leviter incrassati, demum 5 mm. longi, glabri. *Sepala* 6, ovata, obtusa, circiter 3 mm. longa, 2 mm. lata. *Discus* hypogynus, patelliformis, margine crenulatus, glaber. *Ovarium* obscure trilobatum, carnosum, glabrum; styli 3, liberi, circiter 1 mm. longi, apice integri aliquanto reflexi et ampliati. *Capsula* vix matura depresso-globosa, 4.5 mm. diametro, 2.5 mm. alta, stylis persistentibus.

BELGIAN CONGO. Katanga. Elisabethville, Sept. 1911, *Hock* s.n. (Herb. Brux.) :—♀ plant only.

NORTHERN RHODESIA. Solwezi District. On dry burnt ground in dambo at Solwezi, 21 Sept. 1930, *Milne-Redhead* 1164 (type) :—perennial with woody, sometimes running, rootstock ; shoots up to 10 cm. high ; ♂ and ♀ plants.

***Dialium orientale* Bak. f.** in Journ. Bot. 67, 195 (1929) [*Caesalpiniaceae*]. *Dialium reticulatum* Burt. Davy et MacGregor in Kew Bull. 1932, 261 (1932), syn. nov.

Leaves sub-opposite or alternate, rarely opposite, in 1-3, sometimes 4, pairs.

***Isoberlinia densiflora* (Bak.) Milne-Redhead, comb. nov.** [*Caesalpiniaceae*]. *Berlinia densiflora* Bak. in Bull. Misc. Inform. Kew, 1897, 265 (1897) ; Harms in Engl. Pflanzenw. Afr. 3, 1, 469 (1915) ; Bak. f. Leg. Trop. Afr. 687 (1930). *Berlinia Stolzii* Harms in Engl. Bot. Jahrb. 53, 465 (1915), et in Engl. Pflanzenw. Afr. 3, 1, 469 (1915) ; Bak. f. Leg. Trop. Afr. 687 (1930).

Comparison of the type specimen of *Berlinia densiflora* Bak. with a duplicate of the type of *B. Stolzii* Harms convinces me that these two species are conspecific. The tree is common in north-eastern Northern Rhodesia, north Nyasaland and south-western Tanganyika. Excellent material of it has recently been received from Mr. B. D. Burt.

***Isoberlinia magnistipulata* (Harms) Milne-Redhead, comb. nov.** [*Caesalpiniaceae*]. *Berlinia magnistipulata* Harms in Notizbl. Bot. Gart. Berl. 8, 148 (1922) ; Bak. f. Leg. Trop. Afr. 691 (1930) ; Trees and Shrubs of Kenya Colony 63 (1936).

KENYA COLONY. The Mau, G. S. Baker (For. Dep. 308). Makadara, 330 m., *Graham* (For. Dep. 2051) :—bark contains good fibre ; Kiswahili name *Mkwe* ; Digo name *Mukua*. Common on the Coast, *MacNaughtan* 69 (For. Dep. 2618) :—small tree ; flowers white, sweet scented ; Kiswahili names *Mkua*, *Mkwe*. Without locality, Oct. 1932, *MacNaughtan* 205 (For. Dep. 3021) :—shrub ; bark has useful fibre and wood produces good charcoal ; flowers white, sweet-scented, plentiful ; Kiswahili name *Mkwe*. Port Tudor near Mombasa, *Sulemani* (For. Dep. 3236) :—shrub up to 9 m. high ; Kiswahili name *Mkwe*.

TANGANYIKA TERRITORY. Doda, June 1893, *Holst* 2958. In the shade of *Trachylobium* and *Brachystegia* on top of a small cliff. Tanga, 6 km. N. of Amboni on the Mombasa road, 30 m., Dec. 1935, *Burt* 5351 :—spreading tree, 4.5 m. high.

The material here cited is all in the Herbarium of the Royal Botanic Gardens, Kew. The record from the Mau is of interest, as the species is found chiefly in the coastal region of southern Kenya and northern Tanganyika.

Isoberlinia Scheffleri (Harms) Greenway, comb. nov. [Caesalpinaceae]. *Berlinia Scheffleri* Harms in Engl. Bot. Jahrb. **30**, 83 (1901).

TANGANYIKA TERRITORY. Usambara District. Derema, *Scheffler* 201 (type). E. Usambaras. Locally common in evergreen rain forest, *Greenway* 1064:—a tree up to 31 m. high with a much branched bushy spreading crown from 25 m.; white flowers and large flat woody pods, which look like shoe-soles when lying on the ground; native names *Mamba*, *Mtambala*, *Msembe sembe* (Kishamb.), *Mbarika* (Kiswahili). *Zimmerman* 1581.

Acacia Eggelingii Bak. f. in Journ. Bot. **73**, 263 (1935) [Mimosaceae].

ABYSSINIA. Addis Ababa, *Mrs. Armbruster* s.n. (K.).

UGANDA. West Nile District. Seen at Paidia, 1500 m., Okollo, 1200 m., Nebbi, 1350 m., Febr. 1934, *Eggeling* 1528 (For. Dep. 1453) (K.):—tree to 7.5 m., sometimes rather flat-topped; flowers precocious; buds red; stamens white. Logiri, *Eggeling* 1871 (B.M.):—fruiting specimen. Zeio, March 1935, *Eggeling* 1905 (type) (B.M.):—tree attaining 15 m., usually about 6 m.; crown irregular, sometimes flat-topped; flowers more or less precocious, in great profusion; flower-buds red; calyx red; stamens white. Bugishu District. Kaburon, Mt. Elgon, 2040 m., Jan. 1936, *Eggeling* 2490, 2497 (K.):—flowering material.

KENYA COLONY. North Kavirondo District. Singly or gregariously on steep slopes, mixed with *Ficus mallatocarpa*, North Kitosh Reserve, south of Mt. Elgon, 1500–1950 m., Jan. 1931, *Honoré* (For. Dep. 2590) (K.):—thorn tree 12 m. high; flowers appearing before the leaves, cream coloured; legumes light red-brown. Without locality, *Hutchins* (For. Dep. 596) (K.).

As will be seen from the localities of the specimens cited above the distribution of *Acacia Eggelingii* Bak. f. is now known to be wider than it at first appeared to be.

E. MILNE-REDHEAD.

Acacia hebeclada DC. Cat. Pl. Hort. Bot. Monsp. **73** (1813) [Mimosaceae]; DC. Prodr. **2**, 461 (1825); Benth. in Hook. Lond. Journ. Bot. **1**, 499 (1842), **5**, 95 (1846); Harv. in Harv. & Sond. Fl. Cap. **2**, 280 (1861–62); Oliv. in Oliv. Fl. Trop. Afr. **2**, 348 (1871); Benth. in Trans. Linn. Soc. **30**, 504 (1875). *A. stolonifera* Burch. Trav. **2**, 241 (1824); Burt Davy in Bull. Misc. Inform. Kew **1922**, 331 (1922); Bak. f. Leg. Trop. Afr. **836** (1930); Burt Davy Man. Fl. Pl. & Ferns Transv. **340** (1932).

The description of *A. hebeclada* DC. was published twelve years before it reappeared in De Candolle's Prodr. This earlier reference was overlooked by Harvey in the Flora Capensis, whilst Oliver omitted to give any reference in the Flora of Tropical Africa. This unfortunately has resulted in the incorrect adoption of the name *A. stolonifera* Burch. for the species, for Burchell's description is one year earlier than De Candolle's Prodr.

E. MILNE-REDHEAD.

***Acacia nigrescens* Oliv.** in Oliv. Fl. Trop. Afr. 2, 340 (1871) [Mimosaceae]; Benth. in Trans. Linn. Soc. 30, 517 (1875); Bak. f. Leg. Trop. Afr. 829 (1930). *A. nigrescens* Oliv. var. *pallens* Benth. in Trans. Linn. Soc. 30, 517 (1875). *A. pallens* (Benth.) Rolfe in Bull. Misc. Inform. Kew 1907, 361 (1907); Bak. f. Leg. Trop. Afr. 829 (1930); Burt Davy Man. Fl. Pl. & Ferns Transv. 339 (1932). *Albizzia Lugardii* N.E.Br. in Bull. Misc. Inform. Kew 1909, 109 (1909).

Examination of the abundant material now available convinces me that *A. pallens* (Benth.) Rolfe is synonymous with *A. nigrescens* Oliv., and that the blackness of the type specimen of the latter species is due partly to the method of drying and partly to the age of the material. Many of the specimens with pale leaves similar to those of the type specimen of *A. pallens* have the leaf-rhachis unarmed, a character which has been used to diagnose *A. nigrescens*.

E. MILNE-REDHEAD.

***Desmodium setigerum* (E. Mey.) Benth. ex Harv.** in Harv. & Sond. Fl. Cap. 2, 229 (1861-62) [Papilionaceae]. *Nicolsonia setigera* E. Mey. Comm. Pl. Afr. Austr. 124 (1836). *Desmodium Boivinianum* Baill. in Bull. Soc. Linn. Par. 1, 431 (1884). *D. Humboldtianum* Baill. l.c. 431 (1884).

Sub nomen *Desmodium hirtum* (L.) Guill. & Perr. descriptum est—Guill. & Perr. Fl. Senegamb. Tent. 209 (1833); Bak. in Oliv. Fl. Trop. Afr. 2, 163 (1871) pro parte; Schindl. in Fedde Rep. Sp. Nov. Beih. 49, 279 (1928); Hutch. & Dalz. Fl. W. Trop. Afr. 1, 418 (1928); Bak. f. Leg. Trop. Afr. 329 (1929).

The name *Desmodium hirtum* (L.) Guill. & Perr. was a new combination based on *Hedysarum hirtum* L.* Unfortunately, the plant which Guillemin and Perrottet described and cited under the name *Desmodium hirtum* is not conspecific with *Hedysarum hirtum* L., a North American species now known as *Lespedeza hirta* (L.) Hornem.†

Article 54 of the International Rules of Botanical Nomenclature as amended at Amsterdam in 1935 reads "When, on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based, and must be attributed to the author who first published it."

Thus *Desmodium hirtum* (L.) Guill. & Perr. becomes a synonym of *Lespedeza hirta* (L.) Hornem., and the plant described and cited by Guillemin and Perrottet must be known by its next legitimately published name, which is *Desmodium setigerum* (E. Mey.) Benth. ex Harv.

E. MILNE-REDHEAD.

***Mundulea sericea* (Willd.) A. Chev.** in Compt. Rend. 180, 1521 (1925) [Papilionaceae]; Greenway in Bull. Misc. Inform. Kew 1936,

* Sp. Pl. 748 (1753).

† Hort. Havn. 699 (1807).

245 (1936). *Cytisus sericeus* Willd. Sp. Pl. 3, 1121 (1803), non Noronha (1790) (nomen nudum).

When the synonymy of Mr. Greenway's paper was being checked, the fact that the combination *M. sericea*, had already been made by Dr. Chevalier was overlooked, owing to its not having been included in Index Kewensis, Suppl. 7. This was due to the fact that the new combination was printed in the same type as other names and was merely mentioned incidentally in the middle of an economic paper on Leguminosae-Tephrosieae cultivated in tropical countries as fish-poisons. It cannot be too strongly urged that all new names should be printed in a distinctive type, as time does not permit of long general papers being read through line by line for the purposes of the Index.

Cytisus sericeus Noronha, though earlier than *C. sericeus* Willd., was accompanied neither by a description nor by a reference to a previously published description. Noronha probably intended to use the epithet "sericeus" but he actually published it as "*Cytisus sericeus*. *Catiang gude* sp. cogn." This indicated that he was dealing with an already known species bearing the vernacular name *Catiang gude*. As it might be argued that the citation of the vernacular name identified the species concerned and therefore connected the new name *Cytisus sericeus* with a previously published description, thus validating its publication under International Rules, ed. 3, Art. 37, it may be pointed out that according to Filet, Plantkundig Woordenboek voor Nederlandsch-Indië, 154, n. 3958 (1888), the Sundanese vernacular name *Katjang-goedeh* is applied to two species belonging to different genera, namely, to *Cajanus indicus* Spreng. [*C. Cajan* (L.) Millsp.] and *Atylosia scarabaeoides* (L.) Benth. It seems clear, therefore, that the citation of a vernacular name cannot be accepted as an indirect reference to a previously published description. The name *Cytisus sericeus* (or *sericeus*) Nor. (1790), not being validly published, *C. sericeus* Willd. (1803) is not a later homonym (see Art. 61). E. MILNE-REDHEAD.

Teclea villosa M. R. F. Taylor, sp. nov. [Rutaceae]; affinis *T. natalensi* Engl., sed foliolis minoribus obovato-cuneatis villosopubescentibus, petalis extra parce pilosis superne densius pilosis, fructibus villosis differt; a *T. pilosa* (Engl.) Verdoorn foliis 1-3-foliolatis, fructibus majoribus viridibus parcissime hirsutis (haud glabris) facile distinguenda. *T. nobilis* Del. sec. Trees and Shrubs of Kenya Colony, 98 (1936), pro parte, non Del.

Frutex ramosissimus, usque ad 2 m. altus; ramuli juniores villosopubescentes. *Folia* plerumque 3-foliolata, nonnunquam 1- vel 2-foliolata; petiolus 0.5-1.5 cm. longus, leviter compressus, saepe anguste alatus, villosopubescent; foliola sessilia, 1-3 cm. longa, 0.8-1.8 cm. lata, obovata vel oblanceolata, basi cuneata, apice rotundata vel truncata vel interdum emarginata, integra, supra molliter pubescentia nervis prominentibus, subtus glabra

costa pilosa, manifeste glanduloso-punctata; costa saepe 2–3 mm. infra apicem bifurcata. *Racemi* breves, axillares. *Flores* unisexuales, pedicellis brevis; alabastra ovoidea, villosopubescentia. *Calyx* minutus, 4-lobatus, lobis late deltoideis. *Petala* 4, 3–4 mm. longa, oblonga, marginibus et apice incurva, extra leviter pilosa sed apicem versus villosa. *Flores* ♂:—*Stamina* 4; filamenta 5 mm. longa. *Ovarium* abortivum, minutum, villosissimum. *Flores* ♀:—*Staminodia* 4, parva. *Ovarium* globosum, dense villosum, 1–2 mm. longum, 1 mm. latum, 1-loculare; ovula 2; stylus crassus, brevissimus, basi articulatus, mox deciduus; stigma saturate brunneum, late peltatum. *Fructus maturi* virides, irregulariter oblongo-ovoidei, 12–15 mm. longi, 7–9 mm. diametro, carnosius, valde glandulosi, parcissime hirsuti; semina solitaria.

KENYA COLONY. Cultivated in Nairobi Arboretum, without origin or name of collector, no. 111 (Herb. Imp. For. Inst. Oxon. 21022):—native name *Munderendu*.

TANGANYIKA TERRITORY. Shinyanga District. Beda Road Kopjes, amongst great granite rocks clothed with *Commiphora Eminii* and primaeval thicket, 1170 m., May 1935, *Burt* 5123 (♂ fl.) (type) and 5124 (♀ fl. and young fr.):—a thickly branched shrub to 1.8 m. high; bark dark; leaves dark green, aromatic when crushed. Mwamala Kopje, Shinyanga, locally common among *Commiphora Eminii* on thicketed rocky hills, 12 March 1937, *Burt* 5560 (fruits in spirit). Wdode Kopje, Shinyanga, locally common among *Commiphora Eminii* thicketed rocky hills, 1200 m., 7 March 1937, *Burt* 5561. Usambara District. Mkomazi, half way up the mountain opposite Lassa, local in thickets of *Commiphora*, tree *Euphorbia* spp. etc., 1050 m., 30 Nov. 1935, *Burt* 5331:—thick evergreen shrub 1.8 m. high; crushed leaves smell like ivy leaves.

***Raphionacme longituba* E. A. Bruce**, sp. nov. [Asclepiadaceae]; affinis *R. lanceolatae* Schinz var. *latifoliae* N.E. Br., sed floribus majoribus, corollae tubo longiore, coronae lobis integris differt.

Herba perennis, 15–23 cm. alta, tubere crasso depresso-concavo; caules erecti, pauciramosi, parce patenti-pubescentes, sulcati. *Folia* breviter petiolata; petiolus circiter 2 mm. longus, pubescens, supra canaliculatus; lamina oblonga vel obovato-elliptica, basi cuneata vel rotundata, apice rotundata, apiculata, 2.5–6 cm. longa, 1–2.7 cm. lata, utrinque parce puberula, demum glabrescens, margine scabrido-puberula; nervi laterales approximati, numerosi, utrinsecus circiter 30, angulo recto patentes, inter se paralleli, costa media supra canaliculata subius prominente. *Cymae* ex axillis foliorum ortae, pedunculatae; pedunculi 1–2 cm. longi, patenti-pubescentes, plerumque 3-flori, nonnunquam ramosi et usque 8-flori; bracteae lineari-subulatae vel lineari-lanceolatae, usque 5 mm. longae, pubescentes. *Flores* pedicellati; pedicelli usque 1 cm. longi sed plerumque breviores, bibracteolati, bracteolis

lineari-subulatis circiter 4 mm. longis. *Calycis lobi* lanceolati vel lineari-lanceolati, acuminati, nonnunquam recurvati, 4-6 mm. longi, extra patenti-pubescentes, intus glabri. *Corolla* in alabastro breviter patenti-pubescentes, inferne cylindrica, sulcata, superne subito dilatata, conico-ovoidea, acuta, sub anthesi hypocrateriformis, pallide rosea vel alba purpureo-tincta, tubo circiter 1 cm. longo 3 mm. lato, lobis patentibus lanceolatis apice acutis circiter 1 cm. longis basi 3-5 mm. latis carinatis extra pubescentibus intus glabris. *Coronae lobi* 5, integri, apice corollae tubi inserti, lanceolati, apice longe apiculati vel caudati, usque 7 mm. longi, 2-5 mm. lati, glabri, dorso prominente carinati. *Stamina* apice corollae tubi inserta, antheris circiter 2 mm. longis supra stylum conniventibus. *Fructus* ignotus.

TANGANYIKA TERRITORY. Tabora District. Kakoma, south of Tabora, on ant hills, 1170 m., 13 Jan. 1936, *H. M. Lloyd* 45 (type) :—white flowers tinged with purple.

NORTHERN RHODESIA. Mazabuka, c. 1000 m., 7 Dec. 1931, (Cent. Research Sta. 540) :—herb 1-5-2 dm. with pale pink flowers, egg-shaped fruit and bowl-shaped 'bulb.' Mumbwa, *Mrs. Macaulay*, s.n.

Canthium Tophami *Bullock et Dunkley* sp. nov. [Rubiaceae]; floribus numerosis, stylis longissime exsertis distincta; a *C. huillensi* Hiern omnibus partibus glabris recedit; a *C. vulgari* (K. Schum.) Bullock pedunculis pedicellisque glabris, floribus minoribus, stylis longius exsertis differt.

Frutex scandens, statura ignota; ramuli glabri, demum plus minusve teretes, rigidi sed haud crassi, cortice atro-brunneo. *Folia* opposita, tenuiter coriacea, petiolis glabris circiter 1 cm. longis supra canaliculatis praedita; lamina elliptica vel oblongo-elliptica vel plus minusve ovata, usque ad 11 cm. longa et 5-5 cm. lata, apice subacuta vel saepissime obtuse et breviter cuspidata, basi plerumque late rotundata vel (folia immatura) basin versus acute angustata, supra plus minusve nitida, subtus ut videtur pallide viridia, utrinque glaberrima, nervis lateralibus utrinsecus circiter 6 haud prominentibus; stipulae interpetiolares, triangulares, apice caudatae, totae usque ad 8 mm. longae. *Cymae* ex axillis foliorum ortae, pluriflorae, pedunculatae, ramosae, glabrae vel bracteis parvis triangularibus tantum levissime ciliatae; pedunculi 1-1.5 cm. longi; pedicelli gracillimi, usque ad 1 cm. longi. *Flores* ut videtur viridi-lutei. *Calyx* (hypanthio incluso) globosus vel inferne latior circiter 15 mm. longus, glaber, limbo brevissime 5-dentato. *Corolla* alabastro 7-7.5 mm. longa, extra glabra, intus fauce tantum densissime villosa, tubo urceolato 4 mm. longo et 1.5 mm. diametro, limbo 5-fido segmentis sub anthesin recurvis 2-5-3 mm. longis oblongis acutis. *Stamina* 5, filamentis 0.5 mm. longis vel saepe brevioribus, antheris basin versus dorsifixis partim exsertis ellipticis utrinque acutis apice mucronatis basi breviter caudatis. *Ovarium*

parvum, biloculare; ovula in loculis solitaria; discus annularis, carnosus; stylus 1 cm. longus, longe exsertus; stigma mitriforme, 1 mm. longum, apice bifidum. *Drupae* non visae.

NYASALAND. Zomba District, Namiwawa, Nov. 1935, *Clements* 561 (type):—bark used for scabies; native name *mGalamasi*. Soche Mt. Forest Reserve, Nov. 1931, *Topham* 898 (Herb. Imp. For. Inst. Oxon.).

Canthium Tophami Bullock & Dunkley technically stands alone on account of the very long style, but other characters of leaves, inflorescence and flowers place it between *C. huillense* Hiern and *C. vulgare* (K. Schum.) Bullock.

The possibility of the occurrence of a short-styled form of *C. Tophami* must not be overlooked, since heterostyly is known to occur in the genus, and is probably widespread.

***Lasianthus seseënsis* M. R. F. Taylor, sp. nov.** [Rubiaceae]; affinis *L. mayumbensi* R. Good, sed ramis ramulisque compressis haud teretibus, petiolis longioribus, foliis brevius acuminatis subtus praesertim in nervis breviter adpresse pilosis, stipulis latioribus multo majoribus extra pilosis, corollis roseis nec albis, stylo piloso nec glabro differt; a *L. kilmandscharico* Engl. nervis lateralibus foliorum late patentibus leviter arcuatis haud abrupte adscendentibus facile distinguenda.

Frutex erectus, usque ad 1.5 m. altus. *Rami* ramulique compressi, leviter pilosi, vel demum glabri. *Folia* herbacea, leviter discoloria; petiolus 1.5–3 cm. longus; lamina elliptico-lanceolata vel oblongo-lanceolata vel plus minus oblanceolata, 13–18 cm. longa et 2.5–5.5 cm. lata, apice sensim acute acuminata, basi cuneata, supra glabra et plus minusve nitida, subtus praesertim in costa et nervis manifeste adpresse pilosa; nervi laterales utrinsecus circiter 14, late patentibus, leviter arcuati; stipulae plus minusve scariosae, 6 mm. longae, late deltoideae, acutae, extra leviter pilosae. *Flores* sessiles, bibracteati, 7–9 mm. longi, ex axillis foliorum in glomerulis 3–5-floris orti. *Bractee* parvae, deltoideae, acutae, extra pilosae. *Calyx* 3–5-lobatus; lobi triangulari-lanceolati, acuti, 5 mm. longi, extra pilosi; tubus lobis duplo brevior. *Corolla* cylindrica, apicem versus ampliata, extra glabra vel apicem versus pilis longis leviter induta, rosea; lobi 4–5, triangulares, erecti, 7 mm. longi, intus villosi vel apicem versus minus dense pilosi; tubus parte inferiore intus glaber, parte ampliato intus dense villosus. *Stamina* 5–6, fauce inserta; filamenta brevissima, antheris oblongis 1 mm. longis. *Ovarium* 1.5 mm. diametro, apice umbilicato-depressum; discus carnosus. *Stylus* pilosus, 4–5 mm. longus, vix exsertus; rami 5, lineares, 1 mm. longi. *Fructus* 5 mm. diametro, glauco-caerulei, carnosi, circiter 10-lobati, in canaliculis inter lobos parce pilosi, ceterum glabri; pyreni circiter 10.

UGANDA. Entebbe District: Sese Islands in Lake Victoria Nyanza. Locally dominant in undergrowth in Towa forest at about

1200 m., 30 June 1935, A. S. Thomas 1340 (type):—shrub, 1.2 m. high; flowers small, pink; fruits porcelain blue berries. Dominant sub-shrub in forest beside lake, sometimes in pure stands, Bugala, 1140 m., 20 Febr. 1933, A. S. Thomas 821. Subdominant in undergrowth of rain-forest on clay soil, Bugala, 1170 m., 3 June 1932, A. S. Thomas 3:—erect shrub, height 1.5 m.; berries porcelain blue. Frequent in the forests at Sozi, 1110 m., Dec. 1922, Maitland 383:—shrubby plant; fruits waxy white at first then deep blue. Rare near river's edge in forest, Bugaba, 1200 m., Nov. 1915, R. Dümmer 2647:—shrub 1.5 m. high.

Erlangea (Bothriocline) congesta M. R. F. Taylor, sp. nov. [Compositae-Vernoniaeae]; habitu et foliis iis *E. monticolae* M. R. F. Taylor similis, sed capitulis majoribus, floribus pluribus involucri bracteis pluriseriatis interioribus scariosis, achaeniis pluricostatis differt.

Suffrutex usque 1 m. altus. *Rami* divaricati, subteretes, brunnei, leviter striati, apicem versus sericeo-lanati, inferne demum glabrescentes, internodiis brevissimis, 0.5–1 cm. longis, rami ad nodos phyllopodiis persistentibus praediti. *Folia* opposita vel subopposita, ramorum apicem versus congesta, 3.5–7 cm. longa; petioli 4–5 mm. longi, basi saepe connati, circa ramum annulum angustum formantes; lamina ovato- vel elliptico-lanceolata, basi cuneata, apice acuta vel interdum obtusa, 3–6 cm. longa, 1.5–3 cm. lata, margine basin versus fere integra, ceterum serrata vel crenato-serrata, supra fusco-olivaceo-viridis vel griseo-viridis, leviter sericeo-tomentosa demum glabrescens praeter nervos, subtus dense albido- vel griseo-tomentoso-lanatae; nervi laterales utrinsecus 10–14, venis dense reticulatis supra et subtus prominentibus. *Inflorescentia* terminalis, paniculato-corymbosa, congesta, breviter stipitata, capitulis 5–15 pedunculatis 2–4 mm. longis. *Capitula* floribus 120–130 instructa, 1–1.25 cm. diametro, odorata. *Involucri bractee* numerosae, 7–8-seriatae, congestae, apice purpureae; bractee exteriores late ovato-lanceolatae vel deltoideae, 6–7 mm. longae, 2–2.5 mm. latae, acutae vel interdum obtusae, extra dense lanatae, superne intus tomentosae; intermediae obovato-lanceolatae, 9 mm. longae, 3 mm. latae, acuminatae, basi cuneatae, margine late scariosae, extra apicem versus tomentosae; interiores anguste lanceolatae, 7–8 mm. longae, 1.5–2 mm. latae, sensim acuminatae, basi cuneatae, apicem versus minute laciniatae. *Corollae* ex involucrio exsertae, pallide purpureae, glabrae, 7–9 mm. longae; tubus subcylindricus, apicem versus ampliatus, 5–6 mm. longus; lobi lineares, margine et apice crassi, 2–3 mm. longi. *Antherae* vix exsertae, 2 mm. longae, apice et basi acutae. *Styli lobi* filiformes, sensim acuti, leviter papilloso, 1.75–2 mm. longi. *Achaenia matura* glabra, crassa, angulata, oblonga vel late elliptica, 1.75–2 mm. longa, 1 mm. lata, 7–8-costata, costis laevibus flavidis crassissimis latis, regionibus inter costas glandulis

minutis brunneis obsitis. *Pappus* e setis 8-10 pallide fulvis erectis rigidis 1-3 mm. longis scabridis caducis sistens.

UGANDA. Karamoja District. Kaiko Peak (summit), Mt. Debasien, January 1936, *Eggeling* 2712 (type):—Bushy herb 9 dm. high; underside of leaf woolly and white; flowers purple.

Erlangea inyangana (N.E.Br.) B. L. Burti, comb. nov. [Compositae-Vernonieae]. *Bothriocline inyangana* N.E.Br. in Kew Bull. 1906, 107 (1906). *Erlangea Rogersii* S. Moore in Journ. of Bot. 52, 333 (1914).

Erlangea (Bothriocline) monticola M. R. F. Taylor, sp. nov. [Compositae-Vernonieae]; affinis *E. tomentosae* S. Moore, sed habitu suffrutescente divaricato, internodiis brevioribus, ramis phyllopodiis persistentibus praeditis, capitulis majoribus floribus paucioribus instructis, involucris bracteae viridibus haud paleaceis infra apicem lanatis differt; ab *E. paleacea* Chiov. foliis siccitate haud nigrescentibus, capitulis majoribus pallide purpureis floribus pluribus instructis, bracteis haud glabris distinguenda.

Suffrutex usque 1.25 m. altus. *Rami* divaricati, subteretes, griseo-brunnei, leviter striati, sericeo-albido-tomentosi (apicem versus densius), inferne demum glabrescentes, phyllopodiis persistentibus, internodiis brevissimis 0.75-1.25 cm. longis. *Folia* opposita, decussata, ramorum apicum versus congesta, 5-12 cm. longa; petiolus 0.5-1 cm. longus, basi 3-4 mm. persistens, valde dilatatus, cum petiolo opposito connatus; lamina ovato-lanceolata vel oblongo-lanceolata, basi cuneata, apice sensim acuminata, 4-11 cm. longa, 1.5-4 cm. lata, supra olivaceo-viridis, leviter tomentosa demum glabrescens, ad nervos sericeo-albido-tomentosa, subtus dense albido- vel griseo-tomentosa; margine basin versus fere integra vel serrata, dentibus triangularibus apice crassis; nervi laterales utrinsecus circiter 10, venis reticulatis subtus prominentibus. *Inflorescentia* terminalis, panicula, dense corymbosa, breviter stipitata, 3.5-7 cm. lata, 2-3.5 cm. alta, capitulis 20-60 in glomerulis 2-7 mm. pedunculatis. *Capitula* floribus 30-35 instructa, 4-7 mm. diametro, odorata. *Involucris bracteae* 4-seriatae, imbricatae, pallide virides, apice plerumque purpureae, demum fulvae, haud paleaceae; bracteae exteriores ovato-lanceolatae, 3-4 mm. longae, 1.5-2 mm. latae, acutae vel interdum obtusae, dense tomentosae; interiores lanceolatae vel lanceolato-attenuatae, 5-7 mm. longae, 1.5-2 mm. latae, margine inconspicue scariosae, apice apiculatae, inferne lanatae. *Corollae* ex involucrio exsertae, pallide purpureae, glabrae, 7 mm. longae; tubus apicem versus ampliatus, 4 mm. longus; lobi lineares, 3 mm. longi. *Antherae* vix exsertae, 2 mm. longae, apice haud attenuatae, basi rotundatae. *Styli lobi* filiformes, leviter papilloso, 1.75-2.25 mm. longi. *Achaenia matura* glabra, crassa, turbinata, nonnunquam oblonga, 1-1.75 mm. longa, 0.75 mm. lata, 5-7 costata, costis laevibus flavidis prominentibus, regionibus inter costas depressis minute

glandulosus, apice saepe in annulos ampliatis. *Pappus* e setis 6-8 albidis erectis rigidis 1.5-2.5 mm. longis scabridis caducissimis sistens.

UGANDA. Karamoja District. Summit of Mt. Moroto from 2790 m. to 2910 m., February 1936, *Eggeling* 2907 (type):—undershrub to 1.2 m. high; flowers purple.

Pleiotaxis arenaria *Milne-Redhead*, sp. nov. [Compositae-Mutisieae]; a *P. Gossweileri* S. Moore capitulis minoribus angustioribus, phyllis involucris minoribus angustioribus araneo-tomentosis differt.

Herba perennis, erecta, circiter 4 dm. alta; caules leviter ramosi, dense araneo-tomentosi, longitudinaliter striati. *Folia* lanceolata vel oblongo-lanceolata, sessilia, basi plus minusve rotundata, apice acuta, margine irregulariter crenato-denticulata, usque 6 cm. longa, 1.5 cm. lata, supra rugosa, aranea, subtus dense tomentosa. *Capitula* 1-3 in racemos terminales vel axillares disposita, circiter 2 cm. longa, vix 1 cm. lata, breviter pedunculata, pedunculis circiter 0.5 cm. longis; bractae racemorum foliis minutis vel phyllis involucris infimis similes; phylla involucris multi-seriata, exteriora ovata, obtusa, vix 3 mm. longa, dense araneo-tomentosa, interiora lanceolata-oblonga, circiter 11 mm. longa, 2.5 mm. lata, apice obtusa, leviter tomentosa, rubescentia. *Corolla* exserta, splendide sanguinea; tubus 9.5 mm. longus, parte inferiore anguste cylindrica 7 mm. longa, parte superiore cupuliformi 2.5 mm. longa; lobi lineari-acuti, circiter 4 mm. longa, reflexa. *Stamina* apice partis tubi cylindricae affixa; filamenta circiter 2 mm. longa; antherae 6.5 mm. longae exsertae, caudis 2 mm. longis villosis. *Ovarium* 4.5 mm. longum, villosum; stylus cum stigmate 13.5 mm. longus; lobi stigmatis circiter 1 mm. longis. *Pappi* setae rigidae, 11 mm. longae, barbellatae. *Achaenis* non visa.

NORTHERN RHODESIA. Mwinilunga District. On sand in *Cryptosepalum* woodland a few miles south of Mwinilunga, 26 Aug. 1930, *Milne-Redhead* 970 (type):—tomentose perennial, about 4 dm. high; flowers deep crimson. In bush at about 1350-1500 m. elevation, from March to July 1929, *Miss Marks* 117:—small red thistle with greyish woolly leaves.

Volkensia O. Hoffm. The genus *Volkensia* [Compositae-Vernonieae] was described by O. Hoffmann in Engler & Prantl, *Natürlichen Pflanzenfamilien* 4 pt. 5, 387 (1893) and in Engler, *Botanische Jahrbücher* 20, 219 (1894); the single species was *V. argentea* O. Hoffm. from Kilimanjaro. Three further species have since been added by German authors (*V. Elliotii* Muschl., *V. glomerata* O. Hoffm. & Muschl. and *V. latifolia* Muschl.), but in this country the genus has been confused with its near ally *Erlangea* Sch. Bip. *Volkensia* closely resembles *Erlangea* sect. *Bothriocline* in general appearance but differs in having the leaves constantly alternate whereas they are generally opposite in *Erlangea* sect. *Bothriocline*

though alternate in other sections of the genus ; *Volkensia* also has smaller capitula containing fewer flowers, and fewer pappus setae which arise within a cartilaginous rim which crowns the achene.

The classification of the genera of *Vernonieae* is at present very unsatisfactory. *Erlangea* is separated from *Vernonia* only by its caducous pappus and contains a heterogeneous assemblage of species. No useful purpose can be served by considering in detail the relationship of *Volkensia* and *Erlangea* without taking into consideration the general question of the status of genera within this group. For the present, therefore, it seems most convenient to retain *Volkensia* for the natural assemblage of species which may be grouped round *V. argentea* and the following transfers from *Erlangea* are therefore proposed.

Volkensia Duemmeri (S. Moore) B. L. Burtt, comb. nov. *Erlangea Duemmeri* S. Moore in Journ. Linn. Soc. London, Bot. 47, 260 (1925).

Volkensia moramballae (Oliv. & Hiern) B. L. Burtt, comb. nov. *Vernonia moramballae* Oliv. & Hiern in Oliv. Fl. Trop. Afr. 3, 278 (1877). *Bothriocline moramballae* (Oliv. & Hiern) O. Hoffm. in Engl. Pflanzenw. Ost-Afr. C, 403 (1895). *Erlangea moramballae* (Oliv. & Hiern) S. Moore in Journ. Linn. Soc. London, Bot. 35, 313 (1902).

Volkensia ruwenzoriensis (S. Moore) B. L. Burtt, comb. nov. *Erlangea ruwenzoriensis* S. Moore in Journ. Linn. Soc. London, Bot. 35, 309 (1902). *Volkensia Elliotii* Muschl. in Engl. Bot. Jahrb. 46, 52 (1911).

Erlangea ruwenzoriensis and *Volkensia Elliotii* are based on the same gathering, Scott Elliot 7892.

B. L. BURTT.

Ipomoea (Eriospermum) lanata E. A. Bruce, sp. nov. [Convolvulaceae] ; affinis *I. verbascoidi* Choisy sed foliis majoribus, bracteis late obovatis majoribus differt ; ab *I. macrocalyce* Hall. f. cymis axillaribus, corolla glabra, calycis lobis angustioribus minoribus facile distinguenda.

Planta scandens ; caules sulcati, fulvo-lanato-tomentosi, circiter 7 mm. diametro. *Folia* petiolata ; petiolus 5–11 cm. longus, e basi leviter ampliatus, supra leviter canaliculatus, fulvo-lanato-tomentosus ; lamina oblango-ovata vel cordato-ovata, basi truncata vel late cordata, apice rotundata vel subacuta, apiculata, 15–30 cm. longa, 8–20 cm. lata, supra parce costa media et nervis lateralibus densiore lanato-pubescent, subtus albido- vel cinereo-lanata, margine leviter undulata ; nervi laterales utrinsecus circiter 11, conspicui, supra impressi. *Inflorescentiae* cymae densae, circiter 6–10-florae vel abortu pauciores, ex axillis foliorum pedunculatae ; pedunculi petiolis breviores, 2–3 cm. longi, fulvo-lanato-tomentosi, canaliculis glabris muniti ; bracteae magnae, late obovatae, basi cuneatae, apice rotundatae, apiculatae vel emarginatae, 3–4.5 cm. longae, 2–3 cm. latae, extra lanato-tomentosae, intus glabrescentes, nervosae, nervis ascendentibus costa media subparallelis, margine

crispo-undulatae, abortu 2-florae; bracteolae 2, anguste obovatæ, apice rotundatae, extra parce tomentosae, intus glabrae. Flores pedicellati, pedicellis 0.5–1 cm. longis. Calyx usque ad basin lobatus; lobi imbricati, 2 exteriores 3 interioribus paullo majores et eos includentes, oblongo-elliptici, apice rotundati vel subacuti, circiter 2.2 cm. longi, 1.1 cm. lati, extra fulvo-lanato-tomentosi, intus glabri, interioribus medio et apice tomentosis ceterum glabris. Corolla coccinea vel purpurea, infundibuliformis, glabra, 6.5–7.5 cm. longa, tubo basin versus contracto usque 1.5 cm. lato apice in lobos quinque 5.5 cm. diametro expanso. Stamina 5, circiter 1 cm. supra basin corollae inserta; filamenta gracilia, circiter 2 cm. longa, basi ampliata pilis munita; antherae lineares, circiter 5 mm. longae. Ovarium subglobosum, 2 mm. altum, glabrum, disco annulari; stylus simplex, gracilis, circiter 3 cm. longus.

TANGANYIKA TERRITORY. Manyoni District. Kazikazi, climbing over shrubs, *Canthium* etc. in *Berlinia-Brachystegia* woods, 1300 m., 21 Febr. 1934, Burt 5062 (type):—climber with crimson-lake flowers. Tabora District. Kakoma, south of Tabora, on ant-hill, 1170 m., 5 Febr. 1936, H. M. Lloyd 43:—trailer with purple flowers.

It is difficult to describe the inflorescence accurately in detail as the material is insufficient. There are 2 flowers in the axil of each bract and there are up to about 6 bracts in each inflorescence, so there are 12 potential flowers, but a number of these are abortive, and in the two specimens examined there are not more than four flowers mature at the same time in any one inflorescence.

Buchnera scabridula E. A. Bruce, sp. nov. [Scrophulariaceae]; affinis *B. usafuensi* (Engl.) Melch., sed foliis anguste oblongo-oblancoelatis, inflorescentia densiore brevior in statu fructifero haud interrupta, floribus minoribus differt.

Herba usque 0.6 m. alta, leviter ramosa; caules erecti, rigidi, subteretes, nonnunquam parce scabridi, internodiis 1–3 cm. longis, lineis scabrido-puberulis cum basi foliis alternantibus. Folia alterna vel subopposita, sessilia; caulina anguste oblongo-oblancoelata, apice obtusa, apiculata, basi cuneata, 2–3 cm. longa, 5–6 mm. lata, supra parce scabrida, subtus costa media prominente, margine revoluta, utrinque scabrida; folia superiora minora, in bracteis sensim transeuntia. Inflorescentiae terminales, dense spiciformes, in statu fructifero haud interruptae, 4–8 cm. longae, rhachi sulcato scabrido; bractee oblongo-lanceolatae, apice sensim longe acuminatae, nonnunquam recurvatae, 7–9 mm. longae, circiter 2 mm. latae, margine scabridae. Flores subsessiles, bibracteolati; bracteoli lineares, apice acuminati, circiter 5 mm. longi, margine scabridi. Calyx tubulatus, 10-nervosus, 5-lobatus, tubo angusto circiter 7 mm. longo 2 mm. diametro glabro, lobis anguste triangulari-acuminatis 2 mm. longis scabridis. Corolla rosea vel pallide purpurea; tubus e calyce valde exsertus, leviter curvatus, circiter 1 cm. longus, 1.5 mm. latus, fauce dilatatus, extra glaber,

intus apicem versus pilis paucis instructus, ceterum glaber; lobi obovati, apice rotundati, basi cuneati, circiter 5 mm. longi, 3 mm. lati, glabri. *Stamina* circiter medio tubo affixa, filamentis 1 mm. longis, antheris 1.5 mm. longis apice acuminatis. *Ovarium* ellipsoideum, glabrum, 2-2.5 mm. longum, stylo 2.5 mm. longo. *Capsula* oblongo-ellipsoidea, 7 mm. longa, 2.5 mm. diametro, apice truncata, apiculata.

UGANDA. Karamoja District. Mt. Debasien, in alpine meadows, about 3000 m., Jan. 1936, *Eggeling* 2766:—herb with pink flowers.

KENYA COLONY. Marakwet Hills, in scrub near Moyben river, 2800 m., April 1935, *Dale* (For. Dep. 3428) (type):—herb up to 6 dm.; corolla pale purple.

***Dicliptera arenaria* Milne-Redhead** sp. nov. [Acanthaceae]; *D. betonicoëdi* S. Moore valde affinis, sed habitu pauci-ramoso, inflorescentiis longioribus et latioribus, bracteis conspicue villosociliatis, bractea postica magis acuta, floribus majoribus differt.

Herba annua, circiter 6 dm. alta; caules simplices vel superne leviter ramosi, obscure angulati, plus minusve pubescentes, internodiis usque 12 cm. longis. *Folia* inferiora non visa; folia superiora plus minusve deflexa, subsessilia, oblonga vel oblongo-lanceolata, 7.5 cm. longa, 0.9 mm. lata, basi rotundata, apice subacuta, margine hispida; lamina cystolithis dense instructa; petioli brevissimi, cum costis pubescentes. *Inflorescentiae* terminales vel interdum axillares, valde congestae, usque 4 cm. longae, 2.5 cm. diametro, cymis omnibus ad flores 1 vel 2 redactis; bractee inflorescentiam totam subtendentes lineari-lanceolatae, aristatae, circiter 8 mm. longae, ciliatae; bractee oppositae cymam includentes inaequales, margine villosociliatae, pilis albis usque 1.5 mm. longis; bractea antica obovata, 6 mm. longa, 2.7 mm. lata, basi cuneata, apice breviter acuminata, trinervis, nervi et apice bractee viridibus et pubescentibus, ceterum hyalina, glabra, sed parce glandulosa; bractea postica oblanceolata, 9 mm. longa, 1.8 mm. lata, apice acuta, parte superiore et nervis viridibus, ceterum hyalina; bracteolae 4 (utroque latere 2), aequales, lineari-lanceolatae, subulatae, 6 mm. longae, 1 mm. latae, hyalinae, costa viridi, margine ciliatae. *Calyx* fere usque ad basin 5-partitus, 6 mm. longus, lobis lineari-lanceolatis, hyalinis, margine ciliatis. *Corolla* roseo-purpurea, circiter 11 mm. longa, superne extra pubescens, bilabiata; tubus cylindricus, 5.5 mm. longus, angulo 180° spiralter contortus; labium posticum rhomboideum, circiter 4.5 mm. longum, 4 mm. latum, apice integrum, rotundatum; anticum ellipticum, 5.5 mm. longum, 3.5 mm. latum, apice rotundatum, inconspicue 3-dentatum. *Stamina* 2, 0.5 mm. infra apicem corollae tubi inserta; filamenta filiformia, 3.5 mm. longa, parce pubescentia; antherae purpureae, biloculares, loculis superpositis subglobosis vix 1 mm. longis. *Ovarium* circiter 1.2 mm. altum, 4-ovulatum; stylus filiformis, 8.5 mm. longus, parce pubescens, stigmatibus apicali minute bifurcato; discus irregulariter

cupularis, circiter 1 mm. altus. *Capsula* 4.5 mm. longa, compressa, subsessilis. *Semina* 2, brunnea, valde compressa, elliptica vel suborbicularia, basi emarginata, 2.0–2.7 mm. diametro, circiter 0.3 mm. crassa.

NORTHERN RHODESIA. Mwinilunga District. Among dead grass on sandy ground in *Cryptosepalum* woodland not far from R. Wamibobo, 6 Aug. 1930, *Milne-Redhead* 842 :—annual herb, up to 6 dm. high ; lower leaves fallen ; flowers mauve in bracteate heads.

Dicliptera capitata *Milne-Redhead*, sp. nov. [Acanthaceae] ; a *D. Rogersii* Turrill inflorescentiis terminalibus sessilibus, foliis cystolithis instructis, bracteis lanceolatis, seminibus multo majoribus differt.

Herba annua, usque 3 dm. alta, erecta, parce ramosa vel simplex, ramis saepe horizontalibus ; caules parce pubescentes vel puberuli, inconspicue angulati ; internodia 3–7 cm. longa. *Folia* oblongo-lanceolata, acuta, basin versus in petiolos 2 mm. longos constricta, usque 5.5 cm. longa, 0.5 cm. lata, margine, nervis, petiolis nodisque parce et longe hispidis, discolora, cystolithis valde numerosis transversis utrinque dense instructa. *Inflorescentiae* terminales, sessiles, capitatae, usque 15 mm. longae, 23 mm. latae, cymis quisque ad 1–2 flores redactis ; duae bracteae oppositae cymam includentes lanceolatae, acutae vel acuminatae, 8–9 mm. longae, 2 mm. latae, rigidae, 1–3-nerves, praecipue nervis pubescentes, margine valde ciliatae ; bracteolae 4, duae utroque latere, inaequales, anguste lanceolatae, valde acutae, 5–6 mm. longae, pubescentes. *Calyx* fere usque ad basin 5-partitus ; segmenta linearia, valde acuta, 4 mm. longa, tenuiter chartacea. *Corolla* pallide roseo-purpurea, bilabiata, extra deflexo-pilosa ; tubus cylindricus, 5 mm. longus, spiraliter contortus (angulo 180°) ; labium anticum late lanceolatum, apice obtuse breviterque tridentatum, 5.5 mm. longum, 2.3 mm. latum, purpureo-striatum ; labium posticum late triangulare, obtusum, 5.0 mm. longum, 4.5 mm. latum. *Stamina* 2, exserta ; filamenta 4.5 mm. longa, parce deflexo-pilosa ; antherae roseo-purpureae, biloculares, loculis superpositis subglobosis. *Ovarium* 1.5 mm. altum, glabrum, 4-ovulatum ; stylus 7 mm. longus, filiformis, stigmatibus minute bifurcato ; discus cupularis, 0.7 mm. altus. *Capsula* 5 mm. longa, compressa, subsessilis. *Semina* 2, nigra, valde compressa, suborbiculata, emarginata, 2.8 mm. diametro.

TANGANYIKA TERRITORY. Songea District. In savannah bush at 900 m. elevation by R. Likuyu between Songea and Manda, 31 Aug. 1930, *Migeod* 838 (Herb. Mus. Brit.) :—herb with small root and jointed stalks up to 6 dm. high ; leaves in pairs, far apart, 4 cm. × 0.6 cm. ; flowers in terminal bracteate heads.

NORTHERN RHODESIA. Solwezi District. Path-side in *Brachystegia* woodland at Solwezi Boma, 13 June 1930, *Milne-Redhead* 493 (type) :—annual weed, up to 3 dm. high ; flowers mauve. Mumbwa District. Near Mumbwa, 1911, *Mrs. Macaulay* 670.

Dicliptera nemorum *Milne-Redhead*, sp. nov. [Acanthaceae]; a *D. umbellata* (Vahl) Juss. bracteis angustioribus oblongis (haud obovato-oblancoelatis) dense glandulosis, a *D. Rogersii* Turill foliis ovatis vel ovato-lanceolatis, seminibus asperimis differt.

Herba perennis, radicibus fibrosis; caules erecti vel decumbentes, interdum basin versus radicantes, usque 3 mm. diametro, 6 dm. alti, obscure angulati, leviter adpresso-pubescentes; internodia usque 10 cm. longa, saepe supra nodos tumida. *Folia* ovata vel ovato-lanceolata, usque 9 cm. longa, 2.5 cm. lata, basi in petiolum 1–1.5 cm. longum parce adpresse pubescentem attenuata, apice leviter acuminata, acuta; lamina parce adpresse pubescens, cystolithis instructa. *Inflorescentiae* terminales vel axillares, congestae, vix 2 cm. longae, 2 cm. latae, cymis omnibus ad flores 1–2 redactis; bractee inflorescentiam totam subtendentes, aristatae, circiter 7 mm. longae; bractee oppositae cymam includentes inaequales, dense glandulosae, margine basin versus ciliatae; bractea major oblonga, sursum leviter latior, 7 mm. longa, 1.5 mm. lata, apice aristato-acuminata; bractea minor oblongo-lanceolata, 6 mm. longa, 1 mm. lata, apice aristato-acuminata; bracteolae 4 (utroque latere 2), aequales, lineares acutae, 4 mm. longae, 0.5 mm. latae, dense glandulosae. *Calyx* fere usque ad basin 5-partitus, 4 mm. longus, dense glandulosus, segmentis linearibus 0.5 mm. latis bracteolis similibus. *Corolla* rosea, circiter 14.5 mm. longa, superne extra pubescens, bilabiata; tubus cylindricus, 7.5 mm. longus, angulo 180° spiraliter contortus, glaber; labium posticum obovato-oblongum, 7 mm. longum, 3 mm. latum, apice integrum, rotundatum; anticum obovato-oblongum, 7 mm. longum, 4 mm. latum, apice breviter 3-dentatum. *Stamina* 2, 0.5 mm. infra apicem corollae tubi inserta; filamenta filiformia, 10.5 mm. longa, parcissime pubescentia; antherae purpureae, biloculares, loculis superpositis subglobosis vix 1 mm. longis. *Ovarium* circiter 1.2 mm. altum, 4-ovulatum; stylus filiformis, circiter 16.5 mm. longus, glaber, stigmate minute bifurcato; discus cupularis, 0.6 mm. altus. *Capsula* 5 mm. longa, compressa, subsessilis. *Semina* 4, brunnea, leviter compressa, suborbiculata, vix 1.5 mm. diametro, valde aspera.

NORTHERN RHODESIA. Solwezi District. In shade of evergreen vegetation by Mbulungu Stream west of Mutanda Bridge, 15 July 1930, *Milne-Redhead* 712:—perennial up to 6 dm. high in flower and fruit; flowers rose-coloured.

Justicia (Rostellularia) syncollotheca *Milne-Redhead*, sp. nov. [Acanthaceae]; a *J. phyllostachydi* C. B. Cl. omnibus partibus minoribus, calycis lobis glanduloso-pubescentibus recedit.

Herba annua, circiter 3–5 dm. alta, ramosa; rami basin versus horizontales, apicem versus ascendentes, parce pubescentes, obscure angulati; internodia usque 8 cm. longa. *Folia* inferiora non visa; folia superiora ovata vel ovato-lanceolata, 2–3 cm. longa, 4–8 mm. lata, utrinque parce albo-hirsuta. *Inflorescentiae* terminales vel

axillares, substrobiliformes, multiflorae, usque 2.5 cm. longae, 1.5 cm. latae; bractee obovato-ellipticae vel oblanceolatae, circiter 6 mm. longae, 3 mm. latae, apice vix acutae, basin versus attenuatae, utrinque breviter pubescentes, margine pilis albis ciliatae. *Calyx* 4 mm. longa, fere usque ad basin 5-partitus; segmenta lanceolato-subulata, dense et breviter glandulosa et etiam pilis paucis longioribus simplicibus instructa. *Corolla* rosea, 6.2 mm. longa, extra pubescens, bilabiata; tubus cylindricus, 3.7 mm. longus; labium posticum deltoideum, 2.3 mm. longum, basin versus circiter 2 mm. latum, apice corniculis duobus 0.5 mm. longis divergentibus instructum; labium anticum late obovatum, 2.5 mm. longum, trilobatum. *Stamina* 2, circiter 0.7 mm. infra apicem tubi corollae affixa; filamenta circiter 2.0 mm. longa; loculi discreti, ciliati, alter altius affixus, 0.6 mm. longus, muticus, alter inferior, cum appendicula 1.0 mm. longus, loculo inferiori staminis alterius adhaerens. *Ovarium* oblongum, 1.3 mm. altum, glabrum, apice in stylum filiformem 4.2 mm. longum apice breviter bifurcatum parte inferiore leviter pubescens attenuatum, 4-ovulatum; discus cupuliformis, minutus. *Capsula* obovoidea, acuta, 4-4.5 mm. alta, extra pubescens. *Semina* 4, glabra, cinerea, suborbicularia, vix 1 mm. diametro, valde tuberculata.

NORTHERN RHODESIA. Solwezi District. Among grass and on bare ground in *Brachystegia* woodland at Solwezi, 11 June 1930, *Milne-Redhead* 489:—annual herb up to 5 dm. high; branches making a wide angle with the main shoot; flowers rose; capsules four-seeded.

An examination of authentic material of *Justicia phyllostachys* C. B. Cl. in the Kew Herbarium shows that the lower pair of anther cells frequently cohere, a character which it shares with *Justicia syncollotheca* Milne-Redhead, and which is not mentioned by Clarke in his description (Fl. Trop. Afr. 5, 188).

***Monechma praecox* Milne-Redhead**, sp. nov. [Acanthaceae]; a *M. acuto* C. B. Cl. habitu herbaceo praecoci, bracteis minoribus differt.

Herba perennis; caules floriferi e caudice lignoso rigide erecti, circiter 15-20 cm. alti, sine foliis eu-foliaceis, glabri vel pilis albis plus minusve crispatis breviter pubescentes. *Inflorescentiae* 1-3-flores, ex axillis foliorum redactorum exortae, ut videtur spiciformes, terminales; folia redacta oblongo-acuta, vix 6 mm. longa, glabra vel similiter pubescentia, margine ciliata; bractee similes sed saepe minores; pedicelli circiter 1 mm. longi. *Calyx* fere usque ad basin 5-partitus, glaber vel puberulus, circiter 4 mm. longus, lobis cuneatis acutis ciliatis. *Corolla* ochraceo-lactea, bilabiata, intus glabra fauce villosa, extra breviter pubescens; tubus late cylindricus, 5 mm. longus; labium posticum integrum, late ellipticum, circiter 5 mm. longum, vix 5 mm. latum, cucullatum; labium anticum 8 mm. latum, trilobatum, deflexum; lobus medius

suborbicularis, circiter 4 mm. latus; lobi laterales oblongi, apice rotundati, circiter 2 mm. lati. *Stamina* 2, fauci affixa; filamenta filiformia, circiter 4 mm. longa; antherae 2-loculares, loculis discretis, altero altius affixo mutico, altero inferiore cauda alba membranacea integra appendiculato. *Ovarium* oblongum, circiter 2 mm. altum, glabrum, 4-ovulatum, ovulis duobis inferioribus minoribus; stylus filiformis, 7.5 mm. longus, parce pubescens; discus cupuliformis, vix 1 mm. altus. *Capsula* non visa.

NORTHERN RHODESIA. Solwezi District. On burnt ground in dambo at Solwezi, 20 Sept. 1930, *Milne-Redhead* 1150:—perennial with woody rootstock; old shoots burnt off; young flowering shoots rigidly erect, up to 2 dm. high, leafless; flowers creamy white.

Although this plant seems to have affinity with certain species of *Monechma*, it is possible that when the fruit of it becomes known it may be necessary to transfer it to the genus *Justicia* L.

Phayloopsis hispida *Milne-Redhead*, sp. nov. [Acanthaceae]; a *P. Betonica* S. Moore foliis hispidis, tubo corollae calyce longiore, stylo stamina non excedente recedit.

Herba perennis, caulibus decumbentibus usque 1 m. longis parce ramosis obscure quadrangulis breviter pubescentibus vel puberulis internodiis usque 9 cm. longis. *Folia* lanceolata vel ovato-lanceolata, acuminata, apice rotundata, basin versus in petiolum 1–1.5 cm. longum angustata, 8.5 cm. longa, 2.5 cm. lata, supra valde hispida, subtus leviter hispida. *Inflorescentiae* breviter strobiliformes, terminales et ex axillis foliorum summorum exortae; bracteae cymas 1–3-floras subtendentes obovato-ellipticae, 8 mm. longae, usque 4.5 mm. latae; bracteae flores subtendentes minutae, lineares, vix 2 mm. longae; bracteae omnes cum calyce pubescentes pilis glandulosis et eglandulosis intermixtis. *Calyx* fere usque ad basin 5-partitus; segmentum posticum late oblongo-oblancoelatum, apice obtusum, 8 mm. longum, 2.5 mm. latum; segmenta duo antica liguliformia, medium versus leviter angustiora, apice obtusa, 7 mm. longa; duo lateralia subulata, 6.5 mm. longa. *Corolla* alba, 15 mm. longa, extra breviter pubescens; tubus cylindricus, apicem versus anguste infundibuliformis, 10–12 mm. longus, leviter curvatus; lobi obovati, obtusi, subaequales, 3–4 mm. longi, sed limbus ut videtur bilabiatus. *Stamina* 4, inclusa, antheris bilocularibus submuticis 1.5 mm. longis. *Stylus* filiformis, parce pilosus, 4 mm. longus, inclusus; ovarium 4-ovulatum, apice pubescens; discus cupularis. *Capsula* non visa.

NORTHERN RHODESIA. Solwezi District. In evergreen vegetation by stream just west of R. Meheba, 21 July 1930, *Milne-Redhead* 748:—perennial herb growing in shade of evergreen shrubs, with sprawling shoots up to 1 m. long; flowers white with yellow throat.

Ocimum suave *Willd.* Enum. Pl. Hort. Bot. Berol. 629 (1809) [Labiatae]; Bak. in Dyer Fl. Trop. Afr. 5, 338 (1900). *Geniosporum*

discolor Bak. in Dyer Fl. Trop. Afr. 5, 351 (1900), synon. nov. *Ocimum Johnstonii* Bak. in Dyer Fl. Trop. Afr. 5, 345 (1900), pro parte, quoad pl. ex Kapte [Kapete].

The type specimen of *G. discolor* Bak. (Scott Elliot no. 6597) is very young, and in this stage the dense inflorescence gives the plant the appearance of a species of *Geniosporum* Wall. ex Benth. On careful dissection, however, the specimen was found to belong to the genus *Ocimum* L. *G. discolor* has the characteristic decurrent upper calyx-tooth of this genus, and not the tubular subequally toothed calyx and conspicuous basal bracts of *Geniosporum*. It is synonymous with the wide-spread species, *Ocimum suave* Willd. One of the specimens quoted by Baker in the Flora of Tropical Africa under *Ocimum Johnstonii* Bak. (Thomson from Kapte) belongs here, the rest of the material quoted under that species is *O. kilimandscharicum* Guerke, published five years earlier in Engl. Pflanzenw. Ost-Afr. C, 349 (1895).

O. suave is very closely allied to *O. viride* Willd., *O. trichodon* Bak. ex Guerke and *O. gratissimum* L. The two former species are confined to Tropical Africa and the latter is common to India, the Mascarene Islands and Tropical America (according to some authors a varietal form occurs in Tropical Africa). *O. suave* extends through Arabia, Tropical and South Africa to the Mascarene Islands and Ceylon, and is also found in the West Indies.

The distinguishing characters of *O. kilimandscharicum* and *O. suave* are appended below :—

Inflorescence not, or rarely a little branched ; corolla up to 8 mm. long, at least twice as long as the calyx ; stamens long-exserted ; upper-lip of calyx orbicular, widely decurrent ; leaves shortly petiolate, ovate, comparatively small, lamina up to 4 cm. long and 2.5 cm. broad *kilimandscharicum*

Inflorescence much branched ; corolla small, up to 5 mm. long, only slightly longer than the calyx ; stamens shortly exserted ; upper lip of calyx ovate, narrowly decurrent ; leaves very variable, ovate to ovate-lanceolate, narrowly cuneate at the base, petiole up to 3 cm. long, lamina up to 11 cm. long and 5 cm. broad *suave*

E. A. BRUCE.

XLV—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XIX.* E. M. MARSDEN-JONES and W. B. TURRILL.

ANALYSIS OF A WILD POPULATION OF *S. VULGARIS* FROM THE COASTAL CLIFFS OF SOMERSET.

The population of *Silene vulgaris*, one hundred plants of which are analyzed in this paper, was growing on the cliff at Blue Anchor, in the western part of South Somerset, vice-county 5. The cliff starts

* Continued from K.B. 1937, 318.

at the hotel to the east and was populated by *Silene* for about 300 yards. The cliff is 40 to 50 feet in height, and, where the *Silene* plants were growing, is composed of red Keuper marl. The total population of *S. vulgaris* on the cliff was small—probably there were not more than 200 plants of the species, of which about a half were used in preparing this paper. At the top of the cliff there was pasture-land, two fields in length. In the field adjoining the hotel, with fairly long grass, there were a few scattered *Silene* plants. In the second field, with shorter grass, a hundred plants were counted in as many square yards. On portions of the cliff-face there was little or no vegetation, owing to recurrent slipping which removes all or most of the existing vegetation. Plants which start a new colonization include: *Scabiosa arvensis* L., *Plantago lanceolata* L., *Cirsium arvense* (L.) Scop., *Ononis spinosa* L. var. *mitis* (L.), *Convolvulus arvensis* L., *Lotus corniculatus* L., and *Petasites ovatus* L. The plants of *Silene* were, with one exception, growing in association with stabilized vegetation. Only one plant of *S. vulgaris* was seen growing in complete isolation, but in one inaccessible place there were several plants in association with a very scanty vegetation. The list of plants recorded on the cliff-face additional to those mentioned above is: *Bellis perennis* L., *Lathyrus pratensis* L., *Blackstonea perfoliata* Huds., *Rubia peregrina* L., *Trifolium procumbens* L., *Centaurea* sp., *Rumex obtusifolius* L., *Agrimonia eupatoria* L., *Leontodon autumnalis* L., *Lycium chinense* Mill., *Lavatera arborea* L., *Rosa* sp., *Rubus* sp., *Pulicaria dysenterica* Bernh., *Senecio Jacobaea* L., *S. erucifolius* L., *Potentilla erecta* (L.) Hampe, *Achillea Ptarmica* L., *Trifolium medium* (L.) Huds., *Sonchus asper* Hill, *Heracleum Sphondylium* L., *Brassica nigra* L., *Agrostis stolonifera* L., *Lolium perenne* L., *Bromus hordeaceus* L., *Arrhenatherum elatius* (L.) Mert. et Koch, *Dactylis glomerata* L., *Poa pratensis* L., *Agropyron repens* L., *Holcus lanatus* L., *Festuca arundinacea* Schreb., *F. rubra* L. subsp. *fallax* Hack., and *Scleropoa rigida* Griseb.

Part of the cliff was bounded by a hedge composed of *Rosa* sp., *Crataegus monogyna* Jacq., *Prunus spinosa* L., *P. insititia* L., *Rubus* sp., and *Pyrus Malus* L. (as a shrub). At the end of the hedge there was a clump of scrub trees of *Ulmus foliosa* Salisb.

No plants of *Silene maritima* L. were found on the cliff or in the neighbourhood and no indication that it had ever been there. All the facts, both from the field survey and the scoring, suggest that *S. vulgaris* has either attained the cliff-face by seeding down from above or, probably more rarely, slipped masses of plants have lodged in hollows on the cliff-face.

Samples of soil taken from around and between the *Silene* plants showed a pH of 7.5 to 8 when tested colorimetrically. All of five soil samples showed strong to violent bubbling on addition of HCl.

The plants were scored on 1 July 1936, in full flower. Fruit and seed samples were collected on 13 August 1936.

CHARACTER ANALYSIS OF THE POPULATION.

The values for all the qualitative characters, except those of the androecium, are in percentages.

Length of flowering stems :

Maximum	97 cm.
Minimum	31 cm.
Mean	59 cm.
Standard deviation	14.9

This result is not very different from that obtained from the analysis of an inland population of *S. vulgaris* from Wiltshire (K.B. No. 6, 1932, 271).

Habit : all the plants had ascending stems and no barren over-wintering shoots.

Anthocyanin in vegetative parts : the values scored were : very much 2, much 42, medium 36, little 19, none 1.

Stem indumentum : the ratio obtained was : dense 7 : medium 5 : few 1 : glabrous 87.

Leaf indumentum : the ratio obtained was : dense 6 : medium 5 : few 2 : glabrous 87.

There was exact correlation between glabrous stems and glabrous leaves, with 87 per cent. of the sample showing this correlation. There was not exact correlation between density of indumentum on stems and leaves, where indumentum occurred.

Surface of vegetative parts and calyx : all the plants were non-shining dull green (mat).

<i>Leaf length and breadth.</i>				<i>Length.</i>	<i>Breadth.</i>
Maximum	...	...	...	94 mm.	31 mm.
Minimum	...	...	...	16 mm.	6 mm.
Mean	...	...	...	55 mm.	15 mm.
Standard Deviation	...	...	...	12.8	2.7
Correlation of length to breadth				0.43	

The variation in length was greater than that found for the Wiltshire inland population but the variation in breadth was less. The correlation of length to breadth showed little difference—0.46 for the inland population, 0.43 for the coastal population (K.B. 1932, 272).

Number of flowers per inflorescence :

Maximum	...	...	66
Minimum	...	...	4
Mean	...	...	20
Standard Deviation	...	...	9.4

The maximum is slightly higher, the minimum and mean are lower and the standard deviation 9.4 instead of 10, as compared with the Wiltshire inland population (K.B. 1932, 274). The lower minimum and mean are probably due to somewhat greater exposure of the sea-coast population.

Anthocyanin in calyx: the values scored were: very much 6, much 59, medium 59, little 35, none 0. Anthocyanin in both vegetative parts and in calyces is more pronounced in this coastal population than in most inland populations of the species. There is a very low correlation between the development of anthocyanin in the vegetative parts and in the calyx.

Calyx shape: the ratio obtained was: inflated 19: subinflated 80: narrow 1.

Petal colour: all the plants had white flowers.

Petal lobing: all the plants had bilobed petals, except 4 which showed some multilobing.

Depth of lobing: all the plants had petals lobed $\frac{3}{4}$.

Corona: all the plants had bosses on the petals, except 8 which had small scales.

Anthocyanin blotch on petals: all the plants had no anthocyanin blotch, except 6 in which it was present.

Overlapping of petals: the petals were contiguous in 3 plants; in all the others they were neither contiguous nor overlapping.

Overlapping of segments: the segments were contiguous in 17 plants; in all the others they were neither contiguous nor overlapping.

Sex: at the time of scoring the plants were hermaphrodite 37, female 59, hermaphrodite and female 4. The high percentage of purely female plants was remarkable.

Anthocyanin in anthers: in 41 plants (all that produced stamens) anthocyanin was present.

Anthocyanin in filaments: in 36 plants present, in 5 plants absent.

Stigmata colour: in 66 plants purple, in 34 plants white.

Immature seed colour: this was white for all plants except 18, in which it was purple.

A separate collection of fruits and seeds was made from the same population on 13 August 1936. The results of scoring this sample gave:

Fruit shape: I. 29: I.-II. 87: II. 4.

Mature seeds: tubercled 75: weak armadillo 13: armadillo 12.

For a pure *S. vulgaris* population these are rather high numbers of armadillo and weak armadillo seeds.

DISCUSSION AND SUMMARY.

The wild population of *S. vulgaris*, a sample of which is analyzed in this paper, was growing in an unusual habitat and one more normal for *S. maritima* than for the generally inland species *S. vulgaris*. No *S. maritima* occurred in the area and the detailed scorings have shown the population to be pure *S. vulgaris*. The peculiar habitat conditions, and especially proximity to the sea, are possibly the causes of the high development of anthocyanin in the vegetative parts and calyces of many of the individuals. Other distinctive features of the population were the high percentage of female plants and the rather high proportion of weak armadillo and armadillo seeds. The occurrence of 4 plants with multilobed

petals is also interesting. The occurrence of plants with small coronal scales to the petals is not unusual in populations of *S. vulgaris* and is not considered, by itself, an indication of crossing with *S. maritima*. A Wiltshire downland population had 14 % of the plants with small scales as compared with 8 % of the Somerset coastal plants. (*K.B.* 1932, 274.)

S. maritima grows most typically on coastal shingle. It also occurs on river shingle (as in W. Wales) and on hill and mountain scree (Yorkshire, Wales, Scotland). *S. vulgaris* has a somewhat wider range of habitats but occurs most commonly in chalk or limestone grassland, arable fields, on hedge banks, roadsides, and at wood-edges, in the British Isles. Both species occasionally occur on coastal cliffs (see *K.B.* 1929, 36, and *K.B.* 1929, 173) either alone or, more rarely, together. Plants of intermediate character may occur under the latter conditions and show complicated segregations (*K.B.* 1935, 209 seq.). The importance of the present communication is that it shows that in the absence of *S. maritima* a population of *S. vulgaris* growing on a sea-cliff can remain as true to the recognized specific characters as an inland population of the same species.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XLVI—CONTRIBUTIONS TO THE FLORA OF BURMA : XIII.*

The regions shown in brackets after the name of the species are those from which it has been previously recorded.

Artabotrys multiflorus *C. E. C. Fischer*, sp. nov. [Annonaceae] ; ab *A. odoratissimo* R. Br. foliis ellipticis latioribus, floribus numerosis, indumento rufo persistente recedit.

A climber ; branchlets dark brown, rugulose, minutely lenticellate ; ultimate twigs minutely puberulous, transversely ridged. *Leaves* elliptic to elliptic-oblong, abruptly bluntly apiculate or bluntly acuminate, base narrowed, 10–16.5 cm. long, 4–6.5 cm. wide, midrib prominent below, primary nerves 9–12 pairs, slightly raised below, arching and anastomosing near the revolute margins, ultimate reticulations fine, appressed pubescent when young, especially on the midrib beneath, becoming glabrous ; petioles 5–8 mm. long, channelled above. *Peduncle* stout, sharply curved, 1.5–2 cm. long, appressed bristly, bearing two fascicles of numerous flowers, one apical, the other a little removed from it on the outer side ; bracts very small, ovate, pubescent ; pedicels 8–15 mm. long, rufous hispid. *Sepals* triangular-ovate, acute, equal or sub-equal, 3–4 mm. long, rufous pubescent without, glabrous within. *Petals* 6, subequal, oblong to oblong-lanceolate, obtuse, 18–25 mm. long, 6–6.5 mm. wide, deeply concave at the base, the inner slightly narrower and

* Continued from *K.B.* 1935, 576.

more deeply concave at the base than the outer and conniving over the stamens and ovaries, thinly pubescent on both faces above the concave base, densely grey pubescent on the concave part outside, glabrous within, furnished with a thick chevron-like, grey-pubescent ridge on the inside above the concavity. *Receptacle* convex, rufous or fulvous bristly. *Stamens* ∞ , oblong-cuneate, 1.5 mm. long, vertically keeled on the middle of the back, connective truncate, concealing the linear anthers from above. *Ovaries* 12–21, narrowly oblong or lanceolate-oblong, compressed, 1.3–1.5 mm. long, smooth, glabrous; style about as long, oblong or narrowly clavate. *Fruit* not seen.

Amherst District: Dawnas Range, Mekhrein Chaungbya, 3000 ft., flowers Feb., green to yellow, fragrant, *C. E. Parkinson* 5220 (type in Herb. Kew., duplicates in Herb. Bot. Gard. Edinb. and For. Herb. Maymyo).

***Reevesia siamensis* Craib.** [Sterculiaceae].

(Siam)

Amherst District: Dawnas Range, Misty Hollow, 2400 ft., fls. white and frt. Feb., *C. E. Parkinson* 5285; 'small tree 15–20 ft. high; Myitkyna District, Pum-kah Tawng, 2600 ft., fls. and frt. April, *Maung Mya* per *C. E. Parkinson* 5405; "stem brownish-grey; capsule greyish-brown." In this latter specimen the leaves are usually cordate at the base and are much more pubescent than the typical ones; it might well be treated as a variety.

***Sloanea Parkinsonii* C. E. C. Fischer**, sp. nov. [Elaeocarpaceae].

S. hongkongensi Hemsl. similis sed foliis ellipticis majoribus, pedunculis puberulis longioribus, petalis latoribus utrinque puberulis, staminibus petalis brevioribus, capsulis majoribus differt.

A slender tree 17 m. or more high; bark greyish-brown; branchlets grey, dotted with pale-brown, elongate or rounded lenticels; youngest twigs dark, longitudinally furrowed, glabrous. *Leaves* elliptic or elliptic-lanceolate, shortly, abruptly cuspidate, base rounded or cuneate, 9–16 cm. long, 4.5–7 cm. wide, glabrous, brown when dry, primary nerves 6–7 pairs, not much arched, anastomosing near the subundulate margins, ultimate reticulations very fine, subquadrate; petioles 1.3–3 cm. long. *Peduncles* from the year's shoots below the leaves or one or two axillary, solitary, 1-flowered, 3.5–7 cm. long, puberulous; bract at the base very small, deciduous. *Flowers* 1–1.5 cm. across, pale-greenish. *Sepals* ovate, obtuse, 9.5 mm. long, grey-felted on both sides. *Petals* oblate-quadrate, grey-puberulous on both sides, 7.5–8.2 mm. long, 9.2–10.2 mm. wide, apical margin cut into a number of unequal, acute lobes 1.5–3 mm. deep. *Stamens* very many; filaments 1 mm. long, compressed, densely grey-pubescent; anthers narrowly ensiform, 3.5–4.5 mm. long, grey-pubescent, connective produced into an acumen up to 2 mm. long. *Ovary* ellipsoid, 4.5 mm. long, tomentose; style subulate, 7 mm. long, glabrescent upwards.

Capsule 4-valved (in the two seen; 3-5-valved fide Parkinson), about 6 cm. across when open, woody, walls up to 9 mm. thick, purplish-pink within and on the sides of the valves, outside felted-pubescent, fuscous at the base becoming orange-brown at the apex, beset with rather blunt prickles up to 1 cm. long. Seeds not seen.

Amherst District : Dawnas Hills, Makhrein Chaungbya, 3000 ft., fls. and frt. Feb., *C. E. Parkinson* 5217 (type in Kew Herb., duplicates in Bot. Gard. Edin. and Mamyo Forest Herb.)

Syzygium rhamphiphyllum (*Craib*) *C. E. C. Fischer*, comb. nov. [Myrtaceae]; *Eugenia rhamphiphylla* Craib.

(Siam).

Akyab, *Dehra Dun Herb*, 18629; Tenasserim, Victoria Point, 500 ft., fls. white, Jan., *Su Koe per For. Bot. Burma* 6290, "large tree; stem brownish-red; flowers fragrant." This plant was distributed from Dehra Dun as *E. Barringtonii* R. S. Hole ined.

Viburnum punctatum *Ham.* [Caprifoliaceae].

(Nepal, Kumaon, Assam).

Upper Chindwin District : at foot of Leydhei Chin Hill, in loamy evergreen forest, 900 ft., fls. white, April, *Maung Po Chin* per *C. E. Parkinson* 5827; "tree 40 ft. high; wood fairly hard, pale-white, without heartwood."

Sarcosperma arboreum *Benth.* [Sapotaceae].

(Sikkim, Assam).

C. E. Parkinson 4969, without locality.

Styrax Ridleyana *Perk.* [Styracaceae].

(Malay Peninsula and Archipelago).

Myitkyna District : Nawra-Pidaung Reserve, 525 ft., fls. March, *Maung Mya* per *Forest Bot. Burma* 5347, "tree; stem whitish-brown; crown small; flowers white."

Symplocos Pochinii *C. E. C. Fischer*, sp. nov. [Symplocaceae]; *S. monticolae* King et Gamble peraffinis, sed nervis foliorum 9-10, costa subtus rubescente, racemis longioribus haud fasciculatis, floribus numerosioribus, pedicellis articulatis distincta.

A tree 30 m. high 1.6 m. girth; twigs grey-brown, at first with the acuminate buds fulvous pilose, later glabrous. *Leaves* elliptic-oblong, bluntly acuminate, base cuneate or rounded, 11-16 cm. long, 4-5.5 cm. wide, dark-green (when dry) and glabrous above, paler and puberulous on the nerves beneath, margins sinuous-serrate, midrib and 9-10 pairs of lateral nerves slightly impressed above, raised below and reddish or yellowish, the primary nerves arching and anastomosing within the margins, secondary nerves transverse between them; petioles 8-10 mm. long, channelled above. *Racemes* axillary, simple or branched near the base, slender 5-11 cm. long, glabrous, many-flowered; bracts ovate, 2 mm. long, deciduous; pedicels 2-2.2 mm. long; flowers jointed on the pedicels; bracteoles

2, opposite, broadly ovate, 1 mm. long. *Ovary* funnel-shaped, 1.8 mm. long, 3 celled; ovules 1 in the axil of each cell; style rather stout, 2-3 mm. long; stigma large, capitate. *Sepals* 5, very shortly united, semi-circular, 0.8-1 mm. diam. *Corolla* 3.7 mm. long, tube very short; lobes 5, imbricate, broadly oblong. *Stamens* about 70, shortly united into 5 bundles opposite the corolla-lobes; filaments 1-3 mm. long, the outermost longest; anthers of 2 subglobose, divaricate cells 0.4 mm. diam. *Fruit* (immature) globose, 5 mm. diam.

Toungoo District: Pathi drainage, 75 ft., fls., Dec., *Maung Po Chin* per C. E. Parkinson 4394. "In rocky soil in evergreen forest; bark $\frac{1}{4}$ in. thick; wood soft, white, without heartwood; flowers white, mildly scented." (Type in Herb. R. Bot. Gard. Edinb., duplicates in Kew Herb. & Forest Herb. Maymyo).

Exacum tetragonum Roxb. [Gentianaceae].

(Nepal W. Assam; China).

Mandalay District: Sakaugyi Reserve, N. of Taunggun, 2250 ft., fls. Dec., *Maung Mya* per *Forest Bot. Burma* 3670, "1 ft. high; corolla blue"; Pegu District, Salu forest, fls. Dec., J. H. Lace 2848; Maymyo District: near Painwagon, in open swampy place, 3500 ft., fls. March, *Maung Sin* 13547, "fls. deep yellow with orange tips." Don has referred to a golden-yellow variety.

Strobilanthes Hossei C. B. Clarke. [Acanthaceae].

(Siam).

Katha District: Kadu Hill, 3000-4000 ft., fls. Feb., J. H. Lace 5114.

Machilus shweliensis W. W. Smith var. *Myai* C. E. C. Fischer, var. nov. [Lauraceae]; a typo ramulis foliisque pallidioribus. rhachibus paniculisque glauco-purpureis, floribus majoribus distincta,

A small or large tree; stem grey; twigs pale-brown, finely longitudinally furrowed when dry, glabrous. *Leaves* 11.5-20 cm. long, 2.5-4.5 cm. wide, primary nerves 17-20, uniting close to the narrowly cartilaginous, slightly recurved margins, secondary nerves straight, bent or curved transversely between the primaries, ultimate reticulations very fine, giving a pitted appearance on both faces; petioles 1.2-2.2 cm. long, finely longitudinally furrowed as are also the midribs, channelled above. *Panicles* fascicled at the ends of the branchlets, embraced by shaggy, oblong or obovate bracts up to 1.5 cm. long, which are rufous-tomentose without, glabrous within, rufous ciliate, the younger with a silvery sheen; rhachis 5-10 cm. long, glabrous, glaucous-purple; bracteoles lanceolate to ovate, acuminate, margins sometimes with 1-2 large teeth, 4-6.2 mm. long, rufous villous, early deciduous; pedicels 5-7 mm. long, jointed on the branches of the panicle, often bluntly quadrangular when dry. *Perianth segments* 5.5-7.2 mm. long, the inner 3 larger, grey silky pubescent outside, puberulous within. Perfect

stamens 9, the 2 outer rows eglandular, rarely all glandular like the 3rd row; filaments 3-5 mm. long, more or less hairy; anthers oblong, 1.2-1.8 mm. long; 3rd row similar but the filament slightly longer and with a gland attached to the base on either side with stipe 1-1.7 mm. long and a cordate head 1-1.4 mm. long; 4th row reduced to spatulate, more or less hairy staminodes 2.3-3 mm. long with acute trapezoidal apex. Ovary 2 mm. long; style subulate, 2.4-4 mm. long. Fruit not seen.

Bhamo District: Kaunglauh, Lapyikha, 6500 ft., fls. yellow, March, *Maung Mya* per C. E. Parkinson 4990 (type in Herb. Reg. Bot. Gard. Edinb., duplicates in Kew Herb. and in Forest Herb. Maymyo). Vernacular name: *Saman Pun Ko*.

XLVII—ON THE IDENTIFICATION OF RHUS FILICINA SESSÉ ET MOC. EX DC. A. A. BULLOCK.

The publication of the new Anacardiaceous genus *Actinocheita* Barkley in Ann. Missouri Bot. Gard. 24, 1-5, tt. 1-3 (1937), requires comment on account of the controversial nature of the synonymy, and the minor problem in nomenclature involved by the rejection of part of it.

The genus *Actinocheita* is actually based on specimens of *Rhus potentillifolia* Turcz., with which Mr. Barkley has identified, I think erroneously, *Rhus filicina* Sessé et Moc. ex DC. (DC. Prodr. 2, 67: 1825), which is considered by other authors to be identical with *Bursera bipinnata* (Sessé et Moc. ex DC.) Engl.

Rhus filicina DC. is based mainly upon one of Sessé and Mocino's drawings, a reproduction of which is given by Mr. Barkley (*l.c.* t. 1). The drawing is accordingly the type of the name *Rh. filicina*, and De Candolle's description should be interpreted with this in mind. The drawing shows a branch bearing leaves and two inflorescences, and four extremely rough and inadequate sketches of parts of the flower. The fruit is not represented in the drawing, but is described by De Candolle, evidently from Sessé and Mocino's manuscript description of a plant known in Mexico under the vernacular name "Tetlazier." De Candolle had access to Sessé and Mocino's manuscript*, as well as to their drawings, and unfortunately concluded that the drawing of *Rhus filicina*, and that of *Rh. Tetlazier*, the vernacular name of which was Tetlazier†, represented the same species. It appears that De Candolle drew up the description from plate 189 of Sessé and Mocino, and added the description of the fruit and the vernacular name, from the figure (217) and manuscript of *Rhus Tetlazier*.

Rhus Tetlazier Sessé et Moc. is admittedly conspecific with *Rh. potentillifolia* Turcz., which is the type of Mr. Barkley's new generic name *Actinocheita*. Mr. Barkley's identification of *Rhus*

* See Sprague in Kew Bull. 1926, 417-425.

† This at the same time explains the non-inclusion of *Rhus Tetlazier* in the Prodromus.

filicina DC. with *Rh. potentillifolia* depends chiefly on De Candolle's statement that the fruit of the former bears violet hairs, since in a footnote to his paper (Ann. Missouri Bot. Gard. **24**, 3, adnot. 2: 1937), he admits that there is room for doubt in his interpretation of plate 189 of A. de Candolle's Calques, but states that the original description of *Rhus filicina* DC. as "Fructus pilis violaceis hirtus" leaves little doubt as to the species intended. As indicated above, the description of the fruit was presumably taken by De Candolle from Sessé and Mocino's drawing of a plant in a different family! Had Mr. Barkley consulted Dr. Sprague's scholarly account of Sessé and Mocino's Plantae Novae Hispaniae and Flora Mexicana previously mentioned (supra, adnot.* , p. 440), the footnote on the second page of his paper would have been unnecessary, and he might have been able to explain the discrepancy between the fruit of *Bursera bipinnata* (Sessé et Moc. ex DC.) Engl. and that attributed to *Rhus filicina* Sessé et Moc. by De Candolle. The complete synonymy of *Bursera bipinnata* was given in Kew Bull. 1936, 355.

Recognising *Actinocheita* Barkley as a genus distinct from *Rhus*. L., the single species now requires another name:—

***Actinocheita potentillifolia* (Turcz.) Bullock**, comb. nov.

Rhus potentillaefolia Turcz. in Bull. Soc. Nat. Mosc. **31**, 469 (1858).

Rhus filicina DC. in DC. Prodr. **2**, 67 (1825), quoad fructum et nom. vernac. "Tetlazier" tantum.

Rhus Tetlazier Sessé et Moc. Fl. Mex. Ic. 217 (ined.) ex Pl. Nov. Hispan. ed. 1, 47 (1888); ed. 2, 44 (1893).

Toxicodendron potentillifolium (Turcz.) O. Kuntze, Rev. Gen. **1**. 154 (1891).

Actinocheita filicina Barkley in Ann. Missouri Bot. Gard. **24**, 2, tt. 2-3 (1937), et l.c. 310-311, t. 17, fig. 2, quoad descr. et spec. cit., sed excl. syn. *Rhus filicina* et *Bursera bipinnata*.

Mr. Barkley has cited a large number of specimens from the States of Mexico, Guerrero, Oaxaca and Puebla. To these may be added the following historic specimens, which are preserved in the Kew herbarium.

OAXACA: Near Oaxaca, June, *Andrieux* 466, "Arbuste de 12-14 pieds. Fl. rose, tirant sur le roux." Cordillera, Aug. 1840, *Galeotti* 4006A (type number), "Rochers cactiferi Tehuacan. Fl. roseis."

Without exact locality: "Mexico," *Jurgensen* 283.

These specimens are undoubtedly conspecific with *Pringle* 4752, which is also represented at Kew, and is cited by Mr. Barkley as "typifying" the species. Mr. Barkley apparently did not see any of the material distributed by Galeotti under his number 4006A, which is the actual type-collection.

XLVIII—MISCELLANEOUS NOTES.

The Curatorship.—The Minister of Agriculture and Fisheries has appointed Mr. W. M. Campbell, Superintendent of the Parks Department, Southend-on-Sea, as Curator in succession to Mr. J. Coutts, whose retirement was recorded in K.B. 1937, 396.

MR. G. W. ROBINSON.—Mr. G. W. Robinson, Assistant Curator in charge of the Herbaceous Department since 1931, has been appointed Curator of the Physic Garden, Chelsea, in succession to the late Mr. W. Hales, whose death was recorded in K.B. 1937, 320.

Dr. H. G. SCHWEICKERDT.—Dr. H. G. Schweickerdt, who has held the post of Botanist for South Africa at Kew since 1934, has been promoted from the rank of Assistant Professional Officer (Agrostology), Division of Plant Industry, Department of Agriculture, Pretoria, to that of Professional Officer (Botany).

Dr. N. L. BOR.—Dr. N. L. Bor has been appointed Forest Botanist at the Forest Research Institute, Dehra Dun, United Provinces. Dr. Bor was previously Botanical Forest Officer, Shillong, Assam, and recently spent several months study-leave working in the Kew Herbarium.

ANNIE LORRAIN SMITH.—By the death of Miss Annie Lorrain Smith, which took place on September 7th, cryptogamic botany in this country has lost one of its most outstanding characters.

Annie Lorrain Smith was born in 1854, one of a family which became well known in scholastic circles. After a period of general education which included visits to Germany and France, she took up the study of botany under Dr. D. H. Scott, at South Kensington, and later became assistant to Dr. W. Carruthers, who was Keeper of the Department of Botany at the British Museum (Natural History) and also Botanist to the Royal Agricultural Society. She was thus associated with work on seed-testing and became interested in the microfungi associated with germinating seeds. For many years she was responsible for naming most of the fungi which came to the Natural History Museum, but worked especially with microfungi, notably *Hyphomycetes*. Later she turned her attention to lichens, in connexion with the arrangement of the students series of lichens at the Museum, and prepared the second volume of the "Monograph of British Lichens" which had been begun by the Rev. J. M. Crombie. This appeared in 1911, and in 1926 she completed a second edition of the volume. Meanwhile, in 1918, she had also rewritten Crombie's first volume. In 1921 appeared two works which have been most useful to students, namely a "Handbook of British Lichens" which is a condensation

of the larger monograph in the form of a key, and the text book on lichens in the series of Cambridge Botanical Handbooks.

Miss Lorrain Smith was an active member of the British Mycological Society from its beginning, and until a few years ago was a regular attendant at meetings and forays. She was twice President of the Society, in 1907 and 1917. About 3 years ago she was awarded the O.B.E. in recognition of her services to Cryptogamic Botany.

She was a woman of vigorous personality and wide interests. Apart from botany the writer knew her best as a keen supporter of women's demands for full citizenship and equality of opportunity with men. With it all she retained a vivid sense of humour, and was always a stimulating companion. She will be greatly missed by her many friends.

E. M. WAKEFIELD.

ARNOLD SHARPLES.—It is with great regret that we have to record the death of Mr. A. Sharples, A.R.C.S., D.I.C., formerly Government Mycologist in the Department of Agriculture for the Straits Settlements and Federated Malay States.

Arnold Sharples was a native of Burnley, Lancashire, and received his early education at the Burnley Technical School. In 1908 he proceeded to the Royal College of Science, South Kensington, having gained an 1851 scholarship in geology, together with two King's Prizes in geology and mineralogy. There he turned his attention to botany, obtaining a first class in his final examination in 1912 and a diploma in plant physiology. After leaving the Royal College of Science he worked at Kew for about two months in the autumn of 1912, studying fungi under the late Mr. G. Masee, preparatory to taking up an appointment as Assistant Mycologist in the Department of Agriculture, Federated Malay States. He arrived at Kuala Lumpur in January 1913, after a short visit to Germany, and almost immediately became involved in work on diseases of the rubber tree (*Hevea brasiliensis*) and other troubles of the rubber industry. His first paper, on the "Spotting of Prepared Plantation Rubber," appeared as Bulletin 19 of the Department of Agriculture, F.M.S., in February 1914. Early in 1914 he was joined by Mr. F. T. Brooks, who had been appointed as Mycologist for a year, and together they investigated pink disease, due to *Corticium salmonicolor*, publishing a full illustrated account of this disease as Bulletin 21 of the Department of Agriculture. In 1916 Mr. Sharples was promoted to the post of Mycologist, which had been vacant after the return of Mr. Brooks. In 1930 he was seconded for three years to the Rubber Research Institute of Malaya as Head of the Pathological Division, and for a time acted as Director of the Institute. He retired from Government service in 1933 and from the Rubber Research Institute early in 1934.

Sharples' work was concerned mainly with the major diseases of *Hevea*, and either alone or in collaboration with other workers he published many important papers on root diseases, on diseases of the tapping panel such as mouldy rot, brown bast and black stripe, and also observations made on damage caused by lightning and by sun-scorch. Apart from rubber, Sharples was very interested in the diseases of the coconut and other palms. The experience gained in his twenty odd years connexion with the rubber industry of Malaya was incorporated in the book "Diseases and Pests of the Rubber Tree," which was written up after his retirement and published by Macmillan and Co. in 1936. The book, which is intended especially for planters, reveals the author's essentially practical outlook and his grasp of the problems of the grower. By the untimely death of Mr. Sharples so soon after his retirement not only his many friends but the rubber-planting community generally has sustained a very great loss. E. M. WAKEFIELD.

Botanical Magazine.—Part 3 of vol. 160 was published on September 28th and contains the following plant portraits: *Leptochiton quitoensis* Sealy (t. 9491), a new genus of *Amaryllidaceae* from Ecuador allied to *Pancratium* and *Pamianthe*, originally referred by Herbert to *Hymenocallis*; *Rhododendron kongboense* Kingdon Ward ex Rothschild (t. 9492), a native of cliffs at 4000–4350m. in S.E. Tibet; *Melaleuca linariifolia* Smith (t. 9493), from New South Wales and S. Queensland; *Primula Sherriiffae* W. W. Smith (t. 9494), a species with a remarkably long corolla tube, from S.E. Bhutan; *Narcissus asturiensis* (Jord.) Pugsley (t. 9495), the smallest of the wild daffodils from the mountains of Spain; *Amelanchier florida* Lindley forma *tomentosa* Sealy (t. 9496), known in cultivation under the name *A. alnifolia* a native of N.W. America; *Rhododendron desquamatum* Balf. et Forrest (t. 9497), from S.E. Tibet, W. Yunnan and Burma; *Phlox bifida* Beck var. *glandifera* Wherry (t. 9498), the sand phlox with flowers singularly like those of a *Lychnis* or a *Silene*, a native of the United States, especially Indiana and Illinois; *Mutisia oligodon* Poepp. et Endl. (t. 9499), introduced to cultivation from the Andes of Chile and the Argentine by Mr. H. Comber; *Fritillaria gracilis* (Ebel) Aschers. et Graebn. (t. 9500), from Montenegro, Hercegovina and Dalmatia, and *Distylium racemosum* Sieb. et Zucc. (9501), the most widely-spread species of the genus, being known from Japan, Formosa and Hong Kong.

BULLETIN OF MISCELLANEOUS INFORMATION

No. 9 1937

ROYAL BOTANIC GARDENS, KEW

XLIX—NOTES ON THE FLORA OF SOUTHERN AFRICA : VII*. I. C. VERDOORN AND H. G. SCHWEICKERDT.

Acacia barbertonensis H. G. Schweickerd, sp. nov. [Mimosaceae] ; affinis *A. karroo* Hayne et *A. natalitiae* E. Mey., sed foliis subtus glanduloso-punctatis, marginibus foliorum subcrenatis, glandula sessili petioli semper absente, lobis calycis valde glanduliferis bene distinguitur.

Frutex vel arbor parva. *Rami* juniores striati, viscid, glanduliferi, virido-brunnei vel brunnei, subteretes. *Spinae* stipulares valde evolutae, usque ad 4.5 cm. longae, albiae, divaricatae, rigidae, juniores glanduliferae. *Folia* bipinnata, ambitu anguste obovata, usque ad 12 cm. longa et 5 cm. lata, sed plerumque multo minora, inflorescentiam superantia ; petioli 5–15 mm. longi, glanduliferi, subtereti, supra valde canaliculati, glandula sessili absente. *Rhachides* primarii usque ad 7 cm. longi, superne leviter vel valde sulcati, glanduliferi, sursum semper glandulis sessilibus ad basin pinnarum obsiti ; pinnae usque ad 9-jugatae ; pinnarum rhachides usque ad 3.5 cm. longi, glanduliferi, superne sulcati ; foliola fere 10–14-juga, oblonga vel oblique elliptica, basi inaequilateralia et rotundata, apice rotundata vel acuta vel minute mucronulata, carnosula, glabra, viscida, subtus glanduloso-punctata, subsessilia, circiter 1.5–5 mm. longa, 0.75–2.0 mm. lata, inconspicue 1–3-nervia, costa leviter lateral, marginibus glanduloso-punctatis subcrenatisque. *Capitula* solitaria, axillaria, fere 1 cm. diametro, foliis breviora ; pedunculi usque ad 3.5 cm. longi, glanduliferi, supra medium articulati et conspicue bracteati. *Flores* sessiles, lutei. *Calyx* turbinatus vel obconicus, 1.5–2 mm. longus, 5-lobatus ; lobi obtusi vel subacuti, glanduliferi, 0.25 mm. longi. *Corolla* turbinata vel obconica, 3.5–4.00 mm. longa ; corollae tubus 2.5–3 mm. longus ; lobi subacuti vel obtusi, fere 1.0 mm. longi, recurvati. *Stamina* filiformia, circiter 5–6 mm. longa, antheris minutis. *Ovarium* glabrum. *Legumen* leviter vel valde curvatum (falcatum), planum, stipitatum, apice leviter vel valde rostratum, extra glanduliferum, in toto usque ad 8 cm. longum, 0.6–0.8 cm. latum, leviter torulosum vel margine plus minusve sinuatum, brunneum ; seminibus 3–6.

* Continued from K.B. 1935, 209.

TRANSVAAL PROVINCE: Barberton District; Komatipoort, Nov. 1936, comm. *Cotton Experimental Station, Barberton* (typus! Herb. Kew.):—native name "Lubibi"; Barberton, July 1933, leg. *A. Bayer*, s.n.

NATAL PROVINCE: Zululand; Inkungane River, 1000 ft., July 1935, *Bayer* 3446.

The above species is closely allied to both *A. karroo* Hayne and *A. natalitia* E. Mey. It may however be readily distinguished by the conspicuously glandular lower surface and the subcrenate margins of the leaflets, furthermore by the absence of the petiolar gland.

Henkel [Woody Plants of Natal & Zululand, 229 (1934)] states that this plant is "possibly hybrid between *A. karroo* Hayne and *A. glandulifera* Schinz." Until definite evidence is produced to this effect, I am inclined to believe that *A. barbertonensis*, which possesses certain characters not present in any of the supposed parents, is specifically distinct.

***Artemisiopsis villosa* (O. Hoffm.) H. G. Schweickhardt**, comb. nov. [Compositae]; *Amphidoxa villosa* O. Hoffmann in Engl. Bot. Jahrb. 20, 232 (1894). *Artemisiopsis linearis* Sp. Moore in Journ. Linn. Soc. 35, 331 cum ic. tab. 8, fig. a-k (1902).

The nature of the pappus is somewhat variable. In the female florets it consists of either a short corona of rod-shaped hairs cohering laterally or interspersed between these hairs there are a number (1-8) of bristles exceeding the hairs much in length. In the hermaphrodite florets bristles and rod-shaped hairs usually form the pappus, more rarely the latter consists of rod-shaped hairs only. The pappus differs from that found in the genus *Amphidoxa* DC. in which the bristles are plumose-penicillate at the apex and naked towards the base.

The involucre bracts, corolla-lobes and achenes bear many sessile subspherical glands. Similar glands are usually also found to be present on the lower surface of the leaves. Furthermore the leaf-margins may be either entire or remotely dentate.

Hoffmann, l.c., overlooked the true nature of the pappus and probably for this reason described the plant as a species of *Amphidoxa*.

Up to the present the genus *Artemisiopsis* appears to be monotypic and confined to Africa. Its geographic distribution as far as is known is as follows:—

TANGANYIKA TERRITORY: Moshi District, Ugueno, 800 m., 3.7.1893, *Volken* 491 (Herb. Berol., Herb. Kew., Nat. Herb. Pret.).

NYASALAND: Without precise locality, leg. 1895, *John Buchanan* 405 (Herb. Mus. Brit.).

ANGOLA: Dombondola, leg. *Powell Cotton* 2532 (Herb. Kew.):—native name "Omeпо."

SOUTH WEST AFRICA: Otjiwarongo District, Waterberg, May 1928, *Bradfield* 433 (Nat. Herb. Pret.).

Antherothamnus rigida (L. Bolus) E. P. Phillips in Bothalia, 3, ii. 271 (1937) [sphalm. *A. rigida* (L. Bolus) N.E. Br.] [Scrophulariaceae].

To the above the following generic and specific synonyms should be added :—

Selaginastrum Schinz et Thellung in Vierteljahrsschr. Nat. Ges. Zür. 74, 119 (1929).

Selaginastrum karasmontanum (Dinter) Schinz et Thellung l.c. ;

Selaginastrum rigidum (L. Bolus) Schinz et Thellung l.c. H.G.S.

Syncolostemon eriocephalus Verdoorn, sp. nov. [Labiatae] ; a speciebus omnibus inflorescentiis dense albo-sericeo-pilosis valde distincta.

Suffrutex 0.6–1.5 m. altus, valde ramosus ; ramuli sericei. *Folia* opposita, subsessilia, 5–9 mm. longa, 3 mm. lata, lineari-oblonga, argenteo-sericea, foliis minoribus subfasciculatis axillari-busque. *Paniculae* terminales, congestae dense albo-pilosae. *Bractaeae* ovatae, extra dense pilosae, circiter 6 mm. longae, 4 mm. latae. *Calyx* 5-lobatus, extra dense pilosus ; tubus 3 mm. longus ; lobi ovati, 1.1 cm. longi. *Corolla* alba, breviter exserta ; tubus 6 mm. longus, supra ovarium constrictus, 0.5 mm. diametro, faucem versus valde ampliatus, 3 mm. diam. ; corollae lobi inaequales ; superior brevissimus, 0.5 mm. longus, 1 mm. latus ; laterales truncati, 0.75 mm. longi, 2 mm. lati ; inferior 2 mm. longus canaliculatus. *Stamina* exserta ; 2 inferior 2 mm. longus, canaliculatus. *Stamina* exserta ; 2 inferiora filamentis conjunctis, 2 superiora filamentis liberis. *Ovarium* 4-partitum ; stylus 5 mm. longus, bifidus, exsertus.

TRANSCAAL PROVINCE : Lydenburg District ; Pilgrims Hill, D. Morisse 51 (type) ; Blyde River, L. C. C. Liebenberg 3551 ; Edge of Berg, 5000 ft., August 1923, Keet 1111 in *Nat. Herb. Pret.* 2750 :—among scattered bushes along stream ; common ; flowers white.

In localised spots on the high plateau in the Lydenburg District this shrub is found growing among rocks and along streams. It flowers during July–August and the congested, densely pilose panicles, which terminate the branchlets, together with the silvery grey twigs and leaves, make it a conspicuous feature in the otherwise brown wintery aspect of the vegetation. The small opposite leaves bear in their axils dwarf leafy shoots which make the leaves appear to be fascicled. The species is readily distinguished from all others in the genus by the densely pilose panicles.

E—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXXII.* PLANTAE HINTONIANAE :† IV.

FURTHER NOTES ON THE GENUS BURSERA. A. A. BULLOCK.

It is to be regretted that a few alterations in the second edition of Engler und Prantl, *Die Natürliche Pflanzenfamilien*, were

* Continued from K.B. 1937, 310. † Continued from K.B. 1937, 310.

overlooked when the manuscript of my previous paper on the Mexican species of *Bursera** was prepared for the press. Engler in this, his last contribution to our knowledge of the Burseraceae, proposed several new combinations which would have been included in synonymy, and one (*B. confusa*) which was made again. There is a lapsus calami in Engler's account which should be corrected, namely, "*B. subsessiliformis*" for *B. submoniliformis* Engl.† In the previous paper also, the combination *B. arborea* (Rose) Bullock should read *B. arborea* (Rose) Riley in Kew Bull. 1923, 167.

A further very interesting batch of specimens of *Bursera* was collected by Mr. Hinton during 1936, mostly in the State of Guerrero, and the following notes are based on these.

It was found necessary to examine also the material from South America referred to *Bursera graveolens* (H. B. K.) Triana et Planch. before describing two of the new species; the material so named at Kew was found to be a mixture of *B. graveolens* and *B. tomentosa* (H. B. K.) Triana et Planch. as regards the South American specimens, whilst the material from Mexico was found to consist of at least two other distinct species. As most of the Mexican material has been distributed to several herbaria, it was thought advisable to draw attention to it by describing the species concerned. One of these, *B. fragrantissima*, is described by Mr. Hinton (*in litt.*) as "the most fragrant of them (*Bursera* spp.) all," and the specific epithet is based on this statement. In general appearance it resembles the South American *B. graveolens* (H. B. K.) Triana et Planch., but after careful comparison of the available material, I have concluded that that species does not occur in Mexico, and that it varies but little from the type as described by Kunth. On this hypothesis, it is easy to separate *B. fragrantissima* and all other Mexican material from it by means of somewhat slender leaf-characters, which are not as a rule of much value in this genus. This applies also to *B. inopinata*, which is a close ally of both *B. graveolens* and *B. fragrantissima*, and also of the now well-known *B. penicillata* (Sessé et Moc. ex DC.) Engl.

These notes complete the identification of all Mr. Hinton's collections of *Bursera* spp. with the exception of three numbers. These are not in suitable condition for critical determination, but are probably conspecific with other specimens enumerated in my earlier paper on the genus.

A further note, concerning *Bursera bipinnata* (Sessé et Moc. ex DC.) Engl. and its synonymy has been published separately, under the title "On the identification of *Rhus filicina* Sessé et Moc. ex DC."‡

***Bursera confusa* (Rose) Engl.** in Engl. et Prantl, Nat. Pflanzenfam. 2 Aufl. 19a, 426 (1931); Bullock in Kew Bull. 1936, 356, cum syn.

* Bullock in K.B. 1936, 346-386.

† Bullock in K.B. 1937, 352.

‡ Bullock in K.B. 1937, 440.

STATE OF GUERRERO. District of Mina : Placeres*, 400 m., on wooded hills, July 1936 (fr.), *Hinton* 9062, "a slender tree 5 m. high"; Placeres-Mesa, 580 m., July 1936 (fr.), *Hinton* 9088, "a tree 5 m. high"; Patambo, 450 m., July 1936 (sterile), *Hinton* 9174, "a slender tree."

VERNACULAR NAMES : *Copal*, *guande*.

These three specimens, studied in conjunction with those listed previously, and again compared with *B. fagaroides* (H. B. K.) Engl., reveal a further character by which the two species can be readily distinguished. The leaves of *B. confusa* are discolourous, the lower surface being distinctly glaucous, while those of *B. fagaroides* are concolourous.

Bursera coyucensis *Bullock* in Kew Bull. 1936, 358.

STATE OF GUERRERO. District of Mina : Placeres, 450 m., July 1936 (fl.), *Hinton* 9047, "a copal 4 m. high, bark gray and smooth"; Anonas, in woods, July 1936 (sterile), *Hinton* 9067, "a tree 4 m. high, frequent at this locality"; *ibid.*, 360 m., July 1936 (fl., young fr.), *Hinton* 9068, "a spreading tree 6 m. high, wood pliable and sweet-scented."

These three specimens show that the leaves may be 3-7-jugate, as well as 3-5-jugate as stated in the original description, whilst the inflorescence, described from very young specimens, elongates to about 6 cm., the naked peduncle being about 2.5 cm. long.

Bursera diversifolia *Rose* in Contrib. U.S. Nat. Herb. 5, 113 (1897); *Bullock* in Kew Bull. 1936, 359, cum syn.

STATE OF GUERRERO. Manchon, District of Mina, 1100 m., Aug. 1936 (fr.), *Hinton* 9262; "spreading tree 8 m. high: drops of gum exude from the lower part of the trunk: bark and leaves smell like ripe oranges."

As stated in the previous paper (*Bullock, l.c.*) this tree was known previously from a single collection made by Nelson (No. 3066) in the state of Chiapas, and for this reason it was suggested that there was a possibility of its being of hybrid origin. Mr. Hinton notes (*in litt.*), "I must give you a word of warning about *Bursera* no. 9262. I have not been able to find another tree and suggest it may be a sport or hybrid." The resemblance to *B. glabrifolia* (H. B. K.) Engl. previously noted, is again shown in Mr. Hinton's specimen, and it is suggested therefore, that *B. diversifolia* is a hybrid between *B. glabrifolia* and *B. bipinnata* (Sessé et Moc. ex DC.) Engl., both of which occur in the Mina district of Guerrero, and though I have seen no specimens, it seems likely that they also occur in Chiapas, where Nelson first collected *B. diversifolia*.

Bursera grandifolia (*Schlecht*) Engl. in Engl. Bot. Jahrb. 1, 44 (1881), forma *robusta* *Bullock*, forma nov.; a typo habitu robustiore, foliis majoribus differt.

* Placeres has previously been placed in the Coyuca District.

STATE OF GUERRERO. Guadalupe, District of Montes de Oca, 1080 m., just below the oaks, Oct. 1936 (fr.), *Hinton* 9774, "a tree 7 m. high."

A large additional series of specimens of *B. grandifolia* (Nos. 9059; 9060; 9061; 9064; 9065; 9066; 9077; 9078; 9081; 9093; 9553), all from the Mina district, have also been received from Mr. Hinton. These show interesting variations in leaf-form, -size, and -indumentum, and include very large leaves from pollard shoots. The vernacular name is *guande blanco*. The hairy drupes characteristic of this species are also shown by the form named above, of which Mr. Hinton (*in litt.*) says, "... a variety of *B. grandifolia*; a well-established form easily distinguished . . . by the habit. I have seen it elsewhere."

Bursera Hintoni *Bullock* in Kew Bull. 1936, 366.

STATE OF MEXICO. Cañitas, District of Temascaltepec, Oct. 1936 (fr.), *Hinton* 9957 (from the same tree as the type specimen, *Hinton* 6991), "a tree 8 m. high."

STATE OF GUERRERO. Mina District: Placeres-Calavera, 500 m., near the river, July 1936 (sterile), *Hinton* 9108, "a young tree 6 m. high, resinous"; Placeres-Puerta, 720 m., at the head of a barranca, July 1936 (sterile), *Hinton* 9130, "a tree 10 m. high, trunk 30 cm. diam."; *ibid.*, 650 m. in a barranca, July 1936 (fr.), *Hinton* 9136, "a tree 7 m. high, bark smooth and grey"; Manchon, 1250 m., near the river, Aug. 1936 (fr.), *Hinton* 9246, "a spreading tree 12 m. high, frequent by streams and in barrancas from about 600 m. up to 1300 m. This tree taken as (ecological) type of the locality. The ripe fruit falls at a touch."

VERNACULAR NAME: *Tecomaca*.

Some of the specimens now cited show leaves even larger than those mentioned in the original description, and also show that the importance of the length of the infructescence was exaggerated. The latter, however, is always considerably longer than that of the comparatively little-known *B. excelsa* (H. B. K.) Engl., the only species with which it can be confused in the key to the Mexican species proposed in Kew Bull. 1936, 351-353.

Bursera jorullensis (H. B. K.) Engl. in Engl. Bot. Jahrb. 1, 44 (1881); *Bullock* in Kew Bull. 1936, 368, cum syn.

STATE OF GUERRERO. Placeres-Braziles, District of Mina, 400 m., July 1936, *Hinton* 9115; 9116; 9121. Santa Teresa, Mina District, 580 m. "in ripa fluminis Santa Teresa" Sept. 1936, *Hinton* 9362.

These specimens show an interesting variation in the rugosity of the upper surface of the leaf, and serve to confirm at least part of the synonymy suggested in my previous paper. Mr. Hinton's number 9115 was taken from a tree 4 m. high, and consists of three twigs bearing mature leaves (and young fruit), which although somewhat small, show the typical rugose nature of the upper

surface, which is also densely hairy. In addition there is a "shoot from the main trunk near the ground" (*vide* Hinton), with larger leaves showing no trace of rugosity; they are thinly herbaceous in texture, softly and comparatively thinly hairy above, and almost tomentose below. Number 9116 is a sterile twig from a "shrub 30 cm. high at the side of 9115." This is very similar in general appearance to the atypical part of number 9115, but the leaves tend to be larger, less hairy, and a little thicker in texture. Number 9121 has still larger leaves but is otherwise very similar to number 9116. It is from a shrub 1 m. high. Mr. Hinton notes that shrubs of this nature are of frequent occurrence, and that the root-system is generally separate from that of the parent tree; they are therefore either seedlings or root suckers.

The following specimens constitute a still further well-defined form. The characteristic rugosity of the leaflets is well shown, but the leaves and leaflets are smaller than in the type, and approach in size and form those of *B. velutina* (infra, p. 452). The species as represented by this form might be confused with *B. velutina* but for the longer, stouter inflorescences which appear with the mature leaves, and rougher indumentum.

STATE OF GUERRERO. District of Mina: Placeres, on low hills, frequent, July 1936 (fl.), *Hinton* 9046, "a tree 4 m. high"; *ibid.*, 450 m., July 1936 (fr.), *Hinton* 9048; Placeres-Cerrito, on wooded hills, July 1936 (fr.), *Hinton* 9056.

***Bursera sessiliflora* Engl. var. *pubivalvis* Bullock, var. nov.**, a typo *valvis* druporum extra breviter pilosis differt. *Arbor* 4-5 m. alta.

STATE OF GUERRERO. District of Mina: Placeres-Puerta, 800 m., a copal 4 m. high, at the head of a small arroyo, July 1936 (fr.), *Hinton* 9049, 9052 (type); Manchon, 1300 m., in an oak forest, Aug. 1936 (fr.), *Hinton* 9231, "a tree 4 m. high"; Vacas, 940 m., near the river, Aug. 1936 (fr.), *Hinton* 9273, "a tree 5 m. high"; Tierras Blancas, 1400 m., in oak woods, Nov. 1936 (fr.), *Hinton* 9914, "a young copal 4 m. high."

The rare occurrence of a hairy fruit in the genus *Bursera* induces one to wonder whether it is a character on which reliance can be placed. In *B. grandifolia* the hairy drupes seem to constitute a fixed and reliable specific character, the associated differential characters being somewhat vague though nevertheless constant. In the present case I have failed to find any other character by which the variety can be separated from Engler's species, and have recorded it as a named form chiefly in order to call attention to it.

***Bursera Tecomaca* (DC.) Standl.** in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 217 (1929); Bullock in Kew Bull. 1936, 377, cum syn.

STATE OF GUERRERO. District of Mina; Placeres-Cameron, 500 m., on a dry hill, July 1936 (fr.) *Hinton* 9086, "spreading tree

6 m. high, also found at 660 m "; Vacas, 900 m., near the river, frequent, Aug. 1936 (fr.), *Hinton* 9276, "spreading tree 6 m. high"; Placeres-Cigarillo, 400 m., Nov. 1936 (fr.), *Hinton* 9793, "tree 5 m. high, leaves falling."

VERNACULAR NAME: *Guande*.

The identification previously given for this species (Bullock, l.c.), is further confirmed by the three specimens cited above. A noteworthy feature is the tardiness shown in the dehiscence of the drupes. Although Mr. Hinton notes that the leaves are falling in November, the drupes remain firmly closed, and are evidently not yet mature.

***Bursera trimera* Bullock** in Kew Bull. 1936, 379.

STATE OF GUERRERO. District of Mina: Placeres-Cameron, 450 m., July 1936 (sterile), *Hinton* 9083, "a tree 4 m. high"; Cigarillo, 500 m., July 1936 (fr.), *Hinton* 9106, "a tree 4 m. high, frequent here, in woods"; Placeres-Calavera, 500 m., July 1936 (fr.), *Hinton* 9107, "a spreading tree 5 m. high, rather frequent here on wooded hills"; Calavera, 450 m., Nov. 1936 (fr.), *Hinton* 9819 (from the same tree as No. 9107), "a spreading tree 5 m. high. The gum is said to be poisonous. Wood pliable."

VERNACULAR NAME: *Quincanchiri*.

Unifoliate leaves are conspicuously absent on these specimens; number 9107 is the only one with long vegetative shoots, and number 9819 is leafless.

***Bursera velutina* Bullock** in Kew Bull. 1936, 380.

STATE OF GUERRERO. San Jose, District of Mina, 320 m. "in ripa fluminis San Jose," a shrub 2 m. high, Oct. 1936 (sterile), *Hinton* 9622.

There seems to be no doubt that this specimen is conspecific with those cited under the original description; the following, however, appear to be somewhat different, and may be worthy of varietal rank, a view also expressed by Mr. Hinton.

***Bursera velutina* var. *parvifolia* Bullock**, var. nov., a typo foliis foliolisque minoribus marginibus parcius et grossius dentatis, indumento foliorum denso sed brevior et adpressiore recedit. *Frutex* 1.5-3 m. altus.

STATE OF GUERRERO. Placeres, District of Mina, 400 m., on grassy hills with clumps of shrubs here and there, frequent, Aug. 1936 (sterile), *Hinton* 9192, 9193 (type).

The different appearance of the variety is due to the somewhat smaller leaves and leaflets, the latter with fewer and deeper teeth, and the shorter, more closely appressed, but equally dense, indumentum.

***Bursera dubia* Bullock**, sp. nov., peraffinis *B. heterestheti* Bullock (*infra*), sed indumento pubescente haud velutino, ramulis hornotinis et petiolis pedunculisque pubescentibus, foliolis supra demum

nitidis angustioribus basi saepe acute angustatis, calyce majore densius pilosis, staminibus abortivis numquam petaloideis satis distincta.

Arbor 8 m. alta; ramuli hornotini tenuiter longe pubescentes; rami annotini glabri, cortice rubro-brunneo, longitudinaliter striati, satis crassi. *Folia* apice ramulorum abbreviatorum congesta, vel secus ramulos elongatos alterna, saepissime pinnatim 5- vel 7-foliolata, nonnunquam 3-foliolata; interstitia inter juga late serrato-alata, circiter 2 cm. longa et 5 mm. lata; petioli exalati, 2-3.5 cm. longi, pubescentes; foliolum terminale anguste rhombicum, apice subacutum, vix acuminatum, basi cuneatum, usque ad 6 mm. longum et 2-2.5 cm. latum; foliola lateralia sessilia, saepissime anguste elliptica, vix ovata, apice subacuta, basin versus angustata, basi acuta vel obtusa vel angustissime rotundata, usque ad 5 cm. longa et 1.5-2.5 cm. lata, inferiora plerumque parum minora; foliola omnia supra leviter nitida et breviter tenuiter pilosa, subtus pubescentia costa et nervis lateralibus venisque prominentibus, marginibus obtuse vel subacute regulariter serratis. *Inflorescentia* laxe thyrsioidea, pauciflora, foliis brevior, ex axillis perularum delapsarum orta, satis dense pubescens, glandulis stipitatis paucis oblecta, bracteis lineari-subulatis usque ad 1 cm. longis superne multo minoribus praedita, bracteolis nullis; pedunculi 2.5-4 cm. longi; pedicelli 5 mm. longi vel breviores. *Flores* tetrameri, feminei (abortivo-hermaphroditi) tantum visi. *Sepala* 4, basi in annulum coalita, triangularia, acuta, 2 mm. longa et circiter 0.5 mm. lata, extra longe pubescentia, intus glabra. *Petala* 4, oblonga, 3.5 mm. longa, apice subacuta et leviter cucullata, sub anthesi plus minusve naviculiformia, extra pubescentia, intus glabra. *Stamina* 8, sterilia, nunquam petaloidea, filamentis subulatis applanatis 1 mm. longis, antheris abortivis lineari-oblongis 1 mm. longis basin versus dorsifixis. *Discus* tenuis, planus. *Ovarium* ovoideum, apice angustatum, circiter 1.5 mm. longum; stylus circiter 0.5 mm. longus apice stigmate capitato coronatus. *Drupae* anguste obovoideae, apice acutae, 1 cm. longae, 5 mm. diametro. *Semina* lenticuliformia, 3 mm. diametro, dimidio inferiore arillo rubro induta; arillus cupuliformis, carnosus, lateraliter cuspidato-rostratus; testa nigra.

STATE OF GUERRERO. District of Mina: Placeres-Cigarillo, 450 m., July 1936 (young fr.), *Hinton* 9045; *ibid.*, (from the same tree), Sept. 1936 (fr.), *Hinton* 9349 (type). District of Coyuca: Coahuilote, June 1935 (fl.), *Hinton* 7877.

The description of the leaves has been drawn up, mainly, from the mature specimen (no. 9349) and this accordingly has been selected as the nomenclatural type. The younger leaves of the other specimens are more densely hairy, and do not show the shining upper surface, or the prominent veins of the lower surface, indicated in the description. The absence of petaloid staminodes, and the longer, thinner indumentum constitute striking differences between

this and *B. heteresthes* ; a further technical character is to be found in the gynoecium, which in *B. heteresthes* possesses a bifid style and two capitate stigmas, whilst in *B. dubia* there is no sign of division except a shallow longitudinal groove down the middle of the style. The variation to be expected in the floral morphology of species of *Bursera* is, however, unknown and it is by no means certain that the differences noted are of specific value.

***Bursera fragrantissima* Bullock**, sp. nov., a *B. penicillata* (Sessé et Moc. ex DC.) Engl. foliis plerumque 5-foliolatis multo majoribus glabris vel interdum leviter ciliatis et rachin versus leviter puberulis, infructescentiis longioribus, drupis majoribus facile distinguenda ; a *B. graveolente* (H. B. K.) Triana et Planch. rachide foliorum vix alata, foliolis plerumque 5 majoribus grossius serratis, infructescentiis multo longioribus recedit.

Arbor fragrans, 6 m. alta ; rami ramulique satis crassi, glabri, cortice rubro-brunneo. *Folia* apice ramulorum abbreviatorum congesta, internodiis brevissimis, vel secus ramulos elongatos alterna, pinnata, plerumque 5-foliolata, raro 3-foliolata vel in surculis 7-foliolata ; rachis haud alata, glabra ; petioli usque ad 12 cm. longi, vulgo 7-9 cm. longi, glabri ; interstitia inter juga 4-6 cm. longa ; foliolum terminale rhombico-obovatum vel rhombico-ellipticum, 10-12 cm. longum, 2.5-6 cm. latum sed plerumque circiter 4 cm. latum, apice caudato-acuminatum, ad basin cuneatum sed basi ipsa truncatum ; foliola lateralia sessilia, quam terminale leviter minora et angustiora, basi leviter inaequilateralia et latius truncata, ceterum similia ; foliola omnia grosse subacute vel obtuse serrata, supra leviter nitida et parum reticulata, subtus pallidiora, costa et nervis prominentibus leviter reticulata et rachin versus interdum leviter puberula, marginibus interdum brevissime ciliatis, ceterum utrinque glabra. *Inflor*escentia non visa, ut videtur ex axillis perularum orta. *Infructescentia* laxae thyrsioidea, circiter 20 cm. longa, glabra, ut videtur plus minusve pendens ; pedunculi vulgo circiter 6 cm. longi, interdum vix 2 cm. longi ; pedicelli 2-3 cm. longi. *Drupae* plus minusve ellipsoideae, circiter 1.2 cm. longae et 6 mm. diametro, 2-valvatae, valvis prius quam seminibus delabentibus. *Semina* lenticuliformia, 3.5 mm. diametro, dimidio inferiore arillo carnoso rubro lateraliter cuspidato-rostrato induta ; testa nigra.

STATE OF GUERRERO. District of Mina : Manchon, 1150 m., Aug. 1936 (sterile single leaf of a sucker shoot), *Hinton* 9255 ; *ibid.*, 1200 m., Aug. 1936 (fr.), *Hinton* 9339 ; Idolo, 1140 m., " in ripa fluminis del Oro," Oct. 1936 (fr.), *Hinton* 9731 (type).

***Bursera heteresthes* Bullock**, sp. nov. ; a *B. penicillata* (Sessé et Moc. ex DC.) Engl. foliis 3- vel 5-foliolatis (foliolis nunquam numerosioribus) longius petiolatis, foliolis majoribus indumento breviori fere velutino recedit ; a *B. coyucensi* Bullock foliolis majoribus dentibus marginalibus obtusis minus profundis indumento

multo brevior differt ; ab omnibus speciebus petiolis pedunculisque glabris sed foliolis dense pilosis valde distincta.

Arbor 6-10 m. alta ; rami ramulique glaberrimi, demum satis crassi, cortice rubro-brunneo et longitudinaliter lineato. *Folia* secus ramulos elongatos distanter alterna vel nonnunquam apice ramulorum lateralium abbreviatorum congesta ; petioli glaberrimi, usque ad 7 cm. longi ; foliola 3, digitatim disposita, vel 5, pinnatim disposita et interstitio inter juga late serrato-alato ; foliolulum terminale haud petiolulatum, ovatum, usque ad 11 cm. longum et 5 cm. latum, apice acuminatum, basi cuneatum ; foliola lateralia sessilia, ovata vel late ovato-lanceolata, usque ad 11 cm. longa et 5 cm. lata, apice acuminata, basi rotundata, parum inaequilateralia, inferiora (folia 5-foliolata) leviter majora ; omnia (cum ala interstitialis) utrinque (subtus densius) pilis brevibus molliter velutina, marginibus obtuse serratis. *Inflorescentia* pyramidalis, laxe thyrsioidea, tota circiter 10 cm. longa, ex axillis perularum orta, demum e basi ramulorum hornotinorum 2-4-natis verticillata apparentia, glandulis minutis stipitatis sparse praedita ; pedunculi glabri, usque ad 5 cm. longi, ramis suboppositis 3-5-floris vel superne unifloris, bracteis anguste lineari-lanceolatis vel subulatis inferioribus usque ad 9 mm. longis pilosis et stipitato-glandulosis superioribus gradatim minoribus, bracteolis nullis, pedicellis 5-10 mm. longis. *Flores* tetrameri, ut videtur unisexuales, feminei tantum visi. *Calyx* parvus, ad annulum inaequaliter 4-dentatum redactus, dentibus triangularibus usque ad 0.5 mm. longis apicem versus leviter ciliatis. *Petala* 4, oblonga vel levissime spatulata, 3 mm. longa, 1 mm. lata vel paullo latiora, apice abrupte subacute angustata, extra praesertim linea media leviter pilosa. *Staminodia* 8, heteromorpha, petalis aequilonga vel breviora, petaloidea vel filamentis subulatis et antheris abortivis praedita, vel altero latere abortivo-antherifera altero latere petaloidea. *Discus* tenuis, planus. *Ovarium* ovoideum, 1 mm. altum et fere 1 mm. diametro, glabrum ; styli 2, coaliti, apicem versus divergentes, stigmatibus capitatis coronati. *Drupae* obovoideae, 8 mm. altae, 5-6 mm. diametro, glabrae, demum valvis 2 dehiscentes. *Semina* lenticuliformia, 3.5 mm. diametro, dimidio inferiore arillo luteo-rubro induta ; arillus carnosus, cupuliformis, lateraliter cuspidato-rostratus ; testa nigra.

STATE OF MEXICO. Cañitas, District of Temascaltepec, May 1935 (fl., young fr.), *Hinton* 7812 (type) ; *ibid.*, in a barranca, Oct. 1936 (fr.), *Hinton* 9958.

STATE OF GUERRERO. District of Mina : Placeres-Cameron, 450 m., July 1936 (young fr.), *Hinton* 9084 ; Placeres, 450 m., July 1936 (young fr.), *Hinton* 9044 ; Placeres-Cigarillo, 400 m., Sept. 1936 (fr.), *Hinton* 9348, " Fruit ripens gradually, i.e., not all together."

This species is one of those excluded from my previous paper on account of lack of adequate material. Only the specimen now designated as the type was then available. The description has

been drawn up from the two specimens from Temascaltepec, but the others, from Mina, agree with it in all essential characters.

The most obvious character of this species is the glabrous petiole combined with a densely hairy-leaf-blade, the latter with 3 or 5 leaflets. The terminal leaflet of a trifoliolate leaf is sometimes more or less deeply divided into two lobes, but this is obviously accidental and no account of it has been given in the description. The presence of small stipitate glands and weak silvery hairs on the inflorescence branches is briefly noted in the description and these probably constitute an important character. The eight staminodes of the female flowers are remarkable for their diversity of form. In the same flower no two are exactly alike, and they range from organs with subulate filaments and anthers with two empty thecae, to organs almost indistinguishable from petals. Intermediate forms with one side petaloid and the other bearing an anther theca, and others with both sides partly petaloid and partly theciferous, are also found. In every flower examined fertile anthers were absent, and I have not yet seen male or functionally hermaphrodite flowers.

Bursera inopinata *Bullock*, sp. nov., a *B. graveolente* (H. B. K.) Triana et Planch. foliolis plerumque numerosioribus, interstitiis inter juga inferiora alatis, perulis persistentibus apicem versus extra villosis, inflorescentiis longioribus, drupis majoribus recedit.

Arbor, statura ignota, probabiliter mediocris; truncus cortice exfoliato indutus (fide *Gentry*); rami glabri, cortice rubro-brunneo, satis crassi. *Folia* apice ramulorum abbreviatorum congesta, vel secus ramulos elongatos alterna, pinnatim 7-11-foliolata, matura utrinque glabra vel subtus nodis rachidis penicillato-barbata*; foliola anguste lanceolata (spec. *Pringle*) vel lanceolata (spec. *Gentry*) vel late ovato-lanceolata (spec. *Palmer*) 4-8 cm. longa, 1.5-4 cm. lata, apice plerumque caudato-acuminata; lateralibus sessilibus, basi plus minusve angustata sed basi ipsa rotundata vel truncata; terminalia basi acute cuneata; omnia marginibus grosse acute vel obtuse serrato-dentata. *Inflorescentia* laxae thyrsoidae, foliis junioribus aequilonga vel ea superans, ex axillis perularum vel foliorum orta; perulae subpersistentes, ovato-lanceolatae, usque ad 2 cm. longae, subacutae, extra intusque glanduloso-puberulae et apicem versus extra dense villosae; pedunculi usque ad 7 cm. longi, ramis inferioribus usque ad 5 cm. longis, bracteis inferioribus anguste folioso-spatulatis vel linearibus usque ad 1 cm. longis superioribus gradatim minoribus angustioribus ultimis parvis subulato-filiformibus; pedicelli ebracteolati, usque ad 5 mm. longi vel saepe breviores. *Flores* masculi tantum visi. *Calyx* cupuliformis, 1 mm. altus, glaber vel parcissime pilosus, 4-dentatus, dentibus triangularibus acutis 0.5 mm. longis. *Petala* oblonga vel leviter

* This is shown only by *Pringle's* fruiting specimen, No. 2333; this specimen is otherwise very similar to *Pringle's* number 2576, and it may be that both of them represent hybrids whose parentage includes *B. penicillata* (Sessé et Moc. ex DC.) Engl.

spatulata, 3.5 mm. longa, sub anthesi plus minusve naviculiformia, apice leviter cucullata, extra pilis paucis patentibus leviter induta. *Stamina* 8, filamentis subulatis 1.5 mm. longis, antheris oblongo-linearibus 1 mm. longis. *Discus* tenuis, planus. *Ovarium* nullum. *Infructescentia* foliis maturis aequilonga, pedicellis usque ad 1.75 cm. longis apicem versus leviter incrassatis. *Drupae* subglobosae vel leviter lateraliter compressae, apice breviter acute cuspidatae, 1 cm. diametro vel paullo ultra. *Semina* lenticuliformia, 6-7 mm. diametro, dimidio inferiore arillo induta; arillus carnosus, lateraliter cuspidato-rostratus.

STATE OF SONORA. San Bernardo, Rio Mayo, in the tropical Sonoran forest, Aug. 1935 (young fr.), *Scott Gentry* 1585 (distributed as *B. penicillata*) "a tree with peeling bark, herbage [used] for catarrh, resin for toothache and other ailments."

STATE OF CHIHUAHUA. "South-western Chihuahua," without precise locality, 1885 (fr.), *Palmer* Y (type).

STATE OF JALISCO. Rio Grande de Santiago, near Guadalajara, on rocky bluffs, Oct. 1889 (fr.), *Pringle* 2333; near Guadalajara, on rocky hills, June 1889 (fl.), *Pringle* 2576.

VERNACULAR NAMES: *Torote copal*; *Torote prieto* (*Scott Gentry*).

LI—AFRICAN ORCHIDS: IX*. V. S. SUMMERHAYES.

Brachycorythis (§ Basiphyllum) basifoliata *Summerhayes*, sp. nov.; affinis *B. Kalbreyeri* Rchb. f., a qua foliis plerumque radicalibus quam caulina pauca multo longioribus, petalis angustioribus, labelli epichilio simplici suborbiculari apiculato facile distinguenda.

Herba terrestis, circiter 60 cm. alta, glaberrima; caulis e rhizomate repente erectus, pro rata gracilis, teres, circiter 8-foliatus. *Folia* 3-4 infima radicalia, suberecta vel erecto-patentia, e vagina ampla 6-8 cm. longa exorientia, lineari- vel oblongo-lanceolata, apice acutata breviter apiculato-acuminata, basi in petiolum falsum attenuata, tota (vagina inclusa) 19-48 cm. longa, 2-3.5 cm. lata; folia caulina 4, suberecta, lanceolata vel oblongo-lanceolata, basi breviter vaginantia, apice acutata, breviter acuminata, 5.5-19 cm. longa, 1.5-2.5 cm. lata, folio supremo 5.5-7.5 cm. infra inflorescentiam disposito. *Inflorescentia* recta, circiter 17 cm. longa, 4-6 cm. diametro, subdense multiflora; rhachis gracilis; bractae foliaceae, lanceolatae, acuminatae, 1-5 cm. longae, infimae flores aequantes vel superantes. *Flores* erecto-patentes, laete purpurei; pedicelli cum ovariis 2-3 cm. longi. *Sepalum* intermedium erectum, elliptico-ovatum, rotundatum, 11-12 mm. longum, 6-7 mm. latum; sepala lateralia patentia, valde oblique elliptico-ovata, apice obtusa, 15 mm. longa, 9 mm. lata. *Petala* basi cum columna adnata, oblique oblongo-triangularia, basi latere antico valde dilatata fere cordata, apice rotundata, 11 mm. longa, juxta basin 8 mm. lata. *Labellum* porrectum, totum 2 cm. longum; basi utroque margine

* Continued from K.B. 1936, 233.

columnae adnatum, hypochilium saccatum rotundatum circiter 6 mm. longum formans; epichilium lateribus deflexis, suborbiculare, apiculatum, explanatum 14 mm. longum, 13 mm. latum, carina mediana angusta laevissima instructum. *Columna* circiter 6 mm. longa; antherae loculi erecti, paralleli, canalibus brevissimis; pollinii caudiculae breves, viscidia oblongo-elliptica, 1 mm. longa; staminodia compressa, suborbicularia; rostellum lobus intermedius plicatus, cucullatus, lobi laterales auriculiformes, brevissimi; stigma e basi columnari bilobum, lobis erectis \pm conicis apice subulatis.

PRINCIPE. Pico Papagaio, at summit and about 30 m. below, rare, Dec. 1932, *Exell* 680 (type in Herb. Mus. Brit.); 725.

At first I thought that this plant represented a new genus, but on careful examination I have come to the conclusion that it can be placed satisfactorily in *Brachycorythis*. The most striking features are the very long radical leaves and few, quite distant cauline ones, the whole effect thus produced being totally different from that in any other member of the genus. The nearest relative of *B. basifoliata* is undoubtedly *B. Kalbreyeri* Rchb. f., which possesses flowers of about the same size. The column structure in these two species is almost identical, as is also the lip hypochile. With regard to the epichile, *B. basifoliata* can, I think, be regarded as having lost the two large projecting and incurved side-lobes so characteristic of *B. Kalbreyeri* and other members of sect. *Calocorythis*, the central apiculus of the lip of these species thus corresponding to the apex in *B. basifoliata*. As the possession of these side lobes is considered by Schlechter as a diagnostic character of sect. *Calocorythis* I do not feel justified in including the new species in it. I am therefore proposing a new section, *Basiphyllum*, to contain the new species. The diagnosis is as follows:—

Basiphyllum sect. nov. *Brachycorythidis*, ab omnibus aliis sectionibus generis foliis radicalibus caulinis multo longioribus, caulinis paucis, labelli epichilio simplici suborbiculari differt.

Species unica—*B. basifoliata* Summerhayes.

Disperis thomensis Summerhayes, sp. nov.; affinis *D. Kerstenii* Rchb. f., a qua floribus minoribus, labelli appendicibus multo brevioribus intus dense papillosis ut videtur dimidio inferiore connatis differt.

Herba terrestris, umbricola, 10–15 cm. alta. *Tuber* plus minusve cylindricum, circiter 1 cm. longum. *Caulis* erectus, basi vagina membranacea instructus, supra medium bifolius, apice 1–3-florus. *Folia* opposita, breviter petiolata, basi vaginantia; lamina ovata, breviter acuminata, basi rotundata vel subcordata, 2–3 cm. longa, 1.3–2.1 cm. lata. *Flores* reclinati, albi; bracteae foliaceae, lanceolatae, acuminatae, ovario pedicellato multo breviores. *Sepalum* intermedium lanceolatum, acutum, valde concavum, dimidio superiore valde inflexum, cum petalis connatum, galeam brevem

obtusam e basi sepali circiter 5 mm. longam formans; sepala lateraliter oblique obovata, 6 mm. longa, 2.8 mm. lata, margine antico calcaribus incurvato-conicis 2.5 mm. longo instructa. *Petala* ambitu anguste oblonga, incurvata, 6.5 mm. longa, margine antico basi ampliata rotundata, margine postico medio lobo suberecto 1.5 mm. longo ornata, apice breviter bifurcata, furca antica quam postica longiore. *Labellum* basi per 2 mm. ad columnam adnatum, supra columnam lineare, erectum, 4.5 mm. longum, apice abrupte inflexum, apiculum brevissimum obtusum formans, facie superiore juxta apicem appendicibus duabus 6 mm. longis, triente inferiore erectis, deinde reflexis, dimidio inferiore connatis intus papillois apice bipartitis, partitione postica anguste oblonga obtusa, partitione antica lineari apice leviter ampliata leviter incurvata. *Anthera* 1.8 mm. longa; staminodia late truncato-deltaeidea, 0.5 mm. lata. *Rostelli* brachia porrecta, apice leviter ampliata, 1.5 mm. longa. *Ovarium* 1.2–1.7 cm. longum.

SÃO TOMÉ. Vanhulst (Macambrará), 1050–1200 m., virgin forest, in a shady place, Oct. 29th 1932, *Exell* 136 (type in Herb. Mus. Brit.); Oct. 31st 1932, *Exell* 179.

Clearly related to the East African *D. Kerstenii* Rchb. f., on the one hand, and to *D. dicerochila* Summerhayes on the other. In the former the appendages of the lip are much longer, are free from the base and the apical lobes are somewhat spreading or retrorse. In *D. dicerochila* the appendages, although free as in *D. Kerstenii*, are even shorter than in *D. thomensis*. In neither species are the appendages reflexed halfway along; in *D. Kerstenii* they are reflexed with respect to the lip from their point of origin, while in *D. dicerochila* they are erect. In the Transvaal species *D. virginialis* Schltr. and *D. Nelsonii* Rolfe the appendages are also erect, although somewhat longer than in *D. dicerochila*. It is evident that this interesting group within the genus is generally distributed over the tropical parts of Africa, although as yet no species has been found in "Upper Guinea." *D. Reichenbachiana* Welw., an Angolan species, which was also collected by Mr. Exell in São Tomé, is less closely related to *D. thomensis* than are the species previously mentioned.

Nervilia Kotschy (Rchb. f.) Schltr. in Engl. Bot. Jahrb. 45, 404 (1911). *Pogonia Kotschy* Rchb. f. in Oesterr. Bot. Zeitschr. 14, 338 (1864). *P. purpurata* Rchb. f. & Sond. in Flora, 48, 184 (1865). *Nervilia diantha* Schltr. in Engl. Bot. Jahrb. 53, 553 (1915).

An examination of the type specimens of the above cited "species" leads me to conclude that they are conspecific, the trivial name *Kotschy* having a few months priority over *purpurata*. The species is widely spread in Tropical Africa and occurs also in the Transvaal. There is considerable variation in the number and size of the flowers, but I have seen intermediates linking all the extremes. The type of *P. Kotschy*, which comes from the Sudan, is a small-flowered form with only one or perhaps two flowers in the

inflorescence. The Transvaal *P. purpurata*, on the other hand, consists of larger-flowered specimens with two or three flowers, while as many as four flowers occur on some of the Kenya Colony and Uganda specimens in the Kew Herbarium. The sepals vary in length from 12–23 mm.

Orestias stelidostachya Summerhayes, comb. nov. *Microstylis stelidostachya* Rchb. f. *Otia* Bot. Hamburg. 2, 118 (1881). *Orestias elegans* Ridl. in Journ. Linn. Soc. Lond. 24, 198, t. 6 (1887).

Examination of the type specimens of these two species shows that the floral structure is identical, the close resemblance of the vegetative parts having already been pointed out by Ridley. Presumably both Ridley and Rolfe accepted Reichenbach's statement that the column of his species is like that of other *Malaxis* (*Microstylis*) species. This, however, is not the case. The rostellum in Mann 1151 (type of *M. stelidostachya*) is much broadened and fan-shaped, exactly as in other specimens of *Orestias*. I have seen numerous gatherings of *Orestias* made by Mr. Exell in St. Thomas and all show clearly this remarkable rostellum structure. Ridley is also mistaken in stating that the pollinia are not attached to the rostellum. The attachment, which is to the outer angles of the rostellum on each side, can be easily seen both in specimens of this species and of the newly described *O. micrantha*. So far as I can see *Orestias* differs from *Malaxis* only in the rostellum. Other African species of the latter genus, however, although very similar vegetatively and in general floral features, show no intermediate characters, the rostellum being quite narrow in each species. It seems, therefore, most satisfactory to maintain *Orestias* as a distinct genus, but it is undoubtedly very closely allied to *Malaxis* § *Katochilus*.

Orestias micrantha Summerhayes, sp. nov.; ab *O. stelidostachya* (Rchb. f.) Summerhayes floribus minoribus, labello transverse hexagono-elliptico distinguenda.

Herba terrestris, usque ad 30 cm. alta; rhizoma repens, gracile, circiter 2 mm. diametro. *Caules secundarii* erecti vel adscendentes, 2–6 cm. longi, inferne vaginis 2–3 lanceolatis acutis suprema interdum lamina parva instructa ± obtecti, superne vel apice 3–4-foliati. *Folia* breviter petiolata, late lanceolata vel ovato-lanceolata, acuta vel leviter acuminata, basi ± rotundata vel subcordata, 2–6 cm. longa, 1.5–3 cm. lata, siccitate tenuiter chartacea, petiolo cum vagina 1–2 cm. longo. *Inflorescentia* erecta, simpliciter racemosa, 10–22 cm. longa, gracilis, ± dense multiflora; pedunculus 5–8 cm. longus, cataphyllis pluribus sessilibus lanceolatis acutissimis inferioribus basi cordatis amplexicaulibus superioribus bractei-formibus instructus; bracteae lanceolatae, acuminatae, 1.5–3 mm. longae. *Flores* sordide purpurascentes, ovario cum pedicello 1–2.5 mm. longo. *Sepalum* intermedium lanceolato-oblongum, subacutum, 2.5–3 mm. longum, 1.3 mm. latum, uninervium;

sepala lateralibus oblique ovata vel oblongo-ovata, subacuta, 2.3 mm. longa, circiter 1.5 mm. lata, sub-binervia. *Petala* falcatis lanceolato-ligulata, apice bilobata, circiter 2.75 mm. longa, basi 0.75 mm. lata, margine superiore ciliata. *Labellum* sessile, transverse hexagono-ellipticum, apice leviter retusum, basi auriculis rotundatis vix 0.5 mm. longis, circiter 1.5 mm. longum et 2.5 mm. latum, quinque-nervium, nervis tribus centralibus \pm parallelis exterioribus arcuatis, juxta nervos intermedios pulvinis duobus ellipticis pubescentibus instructum. *Columna* incurvata, fere 1 mm. longa, \pm teres, sursum angustata, apice in rostellum late flabellatum subito dilatata; anthera columnae dorso affixa, fere quadrata; pollinia anguste ellipsoidea, rostellis angulis cohaerentia.

CAMEROONS. Bipinde, 1897, *Zenker* 1380 (type); Ekuk, 22 km. E. of Ebolowa, 700 m., June 1911, *Mildbraed* 5733.

This species differs from *O. stelidostachya* (Rchb. f.) Summerh. in the smaller flowers and relatively shorter and broader lip, which possesses two quite distinct pubescent cushions, one on each side of the three central parallel nerves, in the centre of the lip. In *O. stelidostachya* there is usually one large pubescent spot; which is sometimes represented by two distinct ones. These, however, are much nearer the base of the lip and closer together than in *O. micrantha*.

ANSELLIA Lindl.

For some time now botanists have had difficulty in classifying the plants forming this genus. In the Flora of Tropical Africa Rolfe admitted five species, in addition to the South African *A. gigantea* Rchb. f. The species were separated by such characters as the relative widths of the sepals and petals, the number of keels or crests on the lip and their nature, and the sizes of the leaves and flowers. With the accumulation of much more material it has become increasingly difficult to maintain Rolfe's classification in its entirety. Many of his characters as set out are neither constant nor correlated with any other characters.

In my partial treatment of the genus in the Flora of West Tropical Africa I reduced the five tropical species to two, namely, *A. africana* Lindl., with a predominantly western distribution, and *A. nilotica* N. E. Br., which is mainly eastern in distribution. These species were separated by a number of not very well-defined but generally correlated characters. Since then I have studied additional material from southern and eastern Tropical Africa and have also included *A. gigantea* in my investigations.

This study has confirmed my original view that there are two species, one western and one eastern in distribution, the South African plants coming within the limits of the latter. There is, however, a certain amount of further geographical segregation, but this in my opinion does not warrant assigning specific rank to all of the segregates. The following are the species and varieties recognised by me.

Ansellia africana Lindl. in Bot. Reg. 1844, sub t. 12. *A. confusa* N. E. Br. in Lindenia, 2, 36 (1886).

This species, in its widest concept, occurs throughout the western half of Tropical Africa and also in Uganda. It is characterised chiefly by the broad lip with a short, broad, almost obicular middle lobe and by the relatively heavy spotting of the tepals.

In the type form, which occurs in the northern part of the range of the species, the petals are much broader than the sepals and the usually two keels of the lip run out into tubercles on the front lobe.

In Angola, however, there is a form, which, while conforming in general features with *A. africana* type, differs in having the petals only slightly wider than the sepals, while the keels of the lip do not form tubercles in the front part of the middle lobe but gradually die out about half-way along the middle lobe. This I am maintaining as a separate variety, as follows :—

A. africana var. *australis* Summerhayes, var. nov. ; a typo petalis quam sepalis paulo latioribus tantum, labelli lobo intermedio antice non tuberculato differt.

I have seen the following specimens of this variety :—

ANGOLA. R. Kubango, near Chirimba, 1200 m., Oct. 1899, *Baum* 280 (type of variety) ; R. Kunene, below junction with R. Chitanda, 1100 m., Sept. 1899, *Baum* 107 ; Loanda District, *Gossweiler* 494 ; N. of Loanda, sea level, on *Hyphaene benguellensis*, June 1901, *Gossweiler* 12 ; R. Cwelli, 1340 m., on trees in forest, Sept. 1925, *Pocock* 700.

A. gigantea Rchb. f. in Linnaea, 20, 673 (1847).

A. gigantea var. *nilotica* Summerhayes, comb. nov. *A. africana*, var. *nilotica* Baker in Trans. Linn. Soc. Lond. 29, 154 (1875). *A. nilotica* N. E. Br. in Lindenia, 2, 36 (1886). *A. congoënsis* Rodigas ex N. E. Br. in Lindenia, 2, 30, 35, t. 64 (1886). *A. humilis* Bull, Cat. 1891, p. 3.

The above two forms constitute the species *A. gigantea* Rchb. f. in its widest sense. The species is characterised by the relatively narrow petals and especially by the lip, which is nearly always longer than broad and relatively narrow compared with that of *A. africana*. The middle lobe is long and narrow, usually with a distinct claw, while the central nerve is frequently raised to form an additional low keel between the other two at the base of the middle lobe. In addition the spotting of the petals is less heavy and the spots smaller than in *A. africana*, usually on a yellow or greenish-yellow ground.

A. gigantea proper is restricted to Natal, the southern Transvaal, Swaziland and Delagoa Bay. It has relatively small flowers (sepals 15–23 mm. long), very lightly spotted or self-coloured tepals and practically no development on the lateral lobes of the lip of the low keels which are so characteristic of the tropical forms. The plants,

nevertheless, seem to reach much the same dimensions as in the variety.

A. gigantea var. *nilotica* is distributed from Northern Nigeria, Uganda and Kenya Colony in the north, southwards through the eastern parts of Tropical Africa to the Transvaal and Zululand. The flowers are usually considerably larger than in the type (sepals 20–35 mm. long), although forms with smaller flowers do occur, especially in Northern Nigeria. The spotting is nearly always heavier than in *A. gigantea*, while the low keels on the side lobes of the lip are generally clearly and often strongly developed. It will be seen that the differences between type and variety are mostly those of degree, but the very considerable correlation between the various characters in the South African specimens justifies the separation of this form, which has to be taken as the nomenclatural type of the species. Taxonomically, since *Ansellia* is clearly mainly a Tropical African genus, *A. gigantea* type may be regarded as a locally segregated race of the much more widely-spread and more variable var. *nilotica* !

In the delimitation of the species and varieties dealt with only floral characters have been used. There are, however, other respects in which individuals differ from one another, such, for instance, as the fleshiness or slenderness of the pseudobulbs, the number and size of the leaves, the amount of branching and rigidity or otherwise of the inflorescence. So far as I have been able to judge, these differences are not correlated in any satisfactory manner with one another or with either the floral characters or the geographical distribution. However, it must be admitted that in a number of specimens all the necessary data of this type are not available. It may also be possible to separate the species, etc., on ecological grounds, but at present our knowledge is insufficient for this purpose.

Polystachya (§ Caulescentes) parviflora *Summerhayes*, sp. nov. ; affinis *P. eleganti* Lindl., a qua mento brevi nec cylindrico, labello fere quadrato differt ; *P. polychaeten* Kraenzl. revocans, sed inflorescentia paniculata, bracteis multo brevioribus nec subulato-aristatis, foliis brevioribus praedita ; ab utraque labello basi carina alta instructo satis distinguenda.

Herba epiphytica ; caules caespitosi, e rhizomate brevi orti, erecti, fere stricti, 10–20 cm. alti, inferne vaginis imbricantibus acutis obtecti, dimidio superiore 3–5-foliati. *Folia* suberecta, lineari-oblonga vel anguste elliptico-oblonga, apice angustata, breviter sub-acute bidentata, supra articulum 4–14 cm. longa, 7–15 mm. lata. *Inflorescentia* terminalis, paniculata, erecta, tota 10–13 cm. longa ; pedunculus 6–7 cm. longus, spathis duabus valde compressis imbricantibus apice obtusis breviter incurvatis omnino obtectus ; rhachis glabra ; rami e rhachidis dimidio inferiore orti, 2–4, suberecti vel erecto-patentes, usque ad 2 cm. longi ; bractae lanceolatae, acuminatae, ovario pedicellato satis breviores ; pedicelli cum ovariis 2–4 mm. longi, rubri. *Flores* erecto-patentes,

minuti, virides. *Sepalum* intermedium oblongo-ovatum, apiculatum, 1.8 mm. longum, 1.3 mm. latum; sepala lateralalia oblique triangularia, apiculata, cum pede columnae mentum obtusum 1 mm. longum formantia. *Petala* oblique oblongo-elliptica, rotundata, uninervia, 1.3 mm. longa, vix 1 mm. lata. *Labellum* ex ungue fere nullo ambitu fere quadratum, angulis lateralibus rotundato-subacutis, apice paulo truncatum, 1.6 mm. longum et latum, basi carina (vel lamella) alta fere quadrata postice recurvata antice \pm abrupte terminata instructum. *Columna* brevissima, crassa, vix 1 mm. alta, pede incurvato circiter 1 mm. longo; anthera hemisphaerica.

SÃO TOMÉ. Vanhulst (Macambrará), in virgin forest, 1050–1200 m., Nov. 1932, Exell 193a (old fruit only); 450 (type in Herb. Mus. Brit.; isotype in Herb. Kew.).

This interesting species stands in certain respects midway between Kraenzlin's sections *Caulescentes* and *Calluniflorae*. In vegetative characters the species agrees with sect. *Caulescentes* whereas the shape of the leaves and small flowers are characteristic of many species of sect. *Calluniflorae*, in which, however, the bracts are long-aristate and reflexed. *P. parviflora* resembles very closely both *P. elegans* Lindl. in the former section and *P. polychaete* Kraenzl. in the latter. From these species it may be distinguished by the characters given in the diagnosis; a striking feature is the high quadrate lamella at the base of the lip.

Bulbophyllum thomense Summerhayes, sp. nov.; affine *B. tenuicauli* Lindl., a quo pseudobulbis brevioribus, florum colore, sepalis longioribus, petalis lineari-oblongis subacutis, labello majore differt.

Herba epiphytica, pusilla; rhizoma repens, gracile, 1–1.5 mm. diametro; pseudobulbi 3–8 cm. distantes, ovoidei vel elongato-ovoidei, \pm 4-angulati, 1–2 cm. longi, 5–8 mm. diametro, apice bifoliati. *Folia* elliptico-oblonga, interdum sursum leviter attenuata, apice rotundata, obtuse et brevissime bilobulata, 1.8–3.2 cm. longa, 4–7 mm. lata. *Scapi* folia superantes, \pm erecti, graciles, 6–8 cm. longi, subaxe 10–15-flori; pedunculus 2.5–3.5 cm. longus, vaginis 2–4 \pm arctis haud imbricantibus instructus; bractee erecto-patentes, ovatae, acutae, 3–4 mm. longae, rubescentes. *Flores* suberecti, atro-rubri. *Sepalum* intermedium lanceolatum, acutum, 6.5–7 mm. longum, circiter 2.5 mm. latum; sepala lateralalia oblique lineari-lanceolata, subacuta, basi latiora, circiter 6.5 mm. longa, basi 2 mm. lata. *Petala* lineari-oblonga, leviter curvata, subacuta, basin versus leviter angustata, 2 mm. longa, circiter 0.5 mm. lata. *Labellum* arcuatum, \pm oblongum, basi latius, leviter canaliculatum fere breviter bialatum, apice rotundatum, circiter 2.5 mm. longum, 1 mm. latum, dense ciliatum, facie superiore brevissime papillosum. *Columna* brevis, crassa, tota 1.7 mm. longa, steliidiis erectis subulatis acutis dorso basi obtuse dentatis 0.5 mm. longis, antherae filamento triangulari acuto multo longioribus, pede incurvato 2 mm. longo.

SÃO TOMÉ. Lagôa Amelia, in the crater swamp, 1260 m., Nov. 1932, *Exell* 390 (type in Herb. Mus. Brit.; isotype in Herb. Kew.). "Epiphytic on *Schefflera Mannii*; flowers dark red."

Angraecum (§ Pectinaria) doratophyllum *Summerhayes*, sp. nov.; affine *A. pungenti* Schltr., a quo floribus majoribus, labelli calcaris per lato fere triplo longiore medio valde incurvato facile distinguendum.

Herba epiphytica, caulibus repentibus vel \pm pendulis ramosis multifoliatis gracilibus usque ad 35 cm. longis 2–3 mm. diametro parte basali radicibus brevibus flexuosis glabris instructis. *Folia* vaginis paulo imbricatis, suberecta vel cum caule fere parallela, lanceolata, apice pungentia, basi in pseudo-petiolum constricta, carnosae, 1.5–4 cm. longa, 3–5 mm. lata. *Flores* ut videtur solitarii, albi; pedicellus cum ovario 7–10 mm. longus, basi cataphyllis pluribus brevibus obtusis praeditus. *Sepalum* intermedium lanceolato-lineare, subacutum, 11 mm. longum, 1.5 mm. latum; sepala lateralia intermedio similia sed leviter obliqua. *Petala* linearia, subacuta, basi leviter angustata, leviter curvata, 10 mm. longa, vix 1 mm. lata. *Labellum* perlate ovatum, apice recurvato-acuminatum, 6.5 mm. longum, 7.5 mm. latum, inferne in calcar sensim transiens; calcar ex ore latissimo medium versus angustatum, deinde valde recurvatum et leviter inflatum, totum 13–14 mm. longum. *Columna* brevis, 1.5 mm. longa; anthera hemisphaerica, medio leviter sulcata; pollinia pyriformia, stipite uno ligulato 1 mm. longo, viscidio late lunato cornibus reflexis incurvatis fere 1 mm. longo et lato; rostellum usque ad basin bifidum, lobis subacutis.

SÃO TOMÉ. Vanhulst (Macambrará) in virgin forest, 1050–1200 m., Nov. 1932, *Exell* 193; 254 (type in Herb. Mus. Brit.; isotype in Herb. Kew.); 446.

Almost identical with *Angraecum pungens* Schltr. in vegetative characters but showing many differences in the flowers. Of particular interest is the very wide mouth to the spur, which is sharply recurved about the middle. As in *A. pungens* and its near relatives the pollinia are attached to a common viscidium, but in *A. doratophyllum* there seems to be also a stipe which is absent in *A. pungens* and *A. subulatum* Lindl., the pollinia there being sessile.

Angraecopsis gracillima *Summerhayes*, comb. nov. *Mystacidium gracillimum* Rolfe in Kew Bull. 1913, 144.

Unfortunately there is no authentic type specimen of Rolfe's species extant, but from a study of the original description and of the material in the Kew Herbarium it is evident that the above new combination is correct. There are two specimens, both accepted as *Mystacidium* by Rolfe, which agree with the description and undoubtedly belong to the genus *Angraecopsis*. One of these was received from the Glasnevin Botanic Gardens and was said to come from Uganda; the other was collected by E. Brown in Uganda and

was received through Sir Trevor Lawrence in 1908. Since *Mystacidium gracillimum* was described from a plant cultivated at Glasnevin and collected by E. Brown in Uganda, it seems probable that the two Kew specimens are from the same source as the type. There are several other more recently collected specimens at Kew, all from Uganda or western Kenya Colony, in the vicinity of Mt. Elgon and Lake Victoria. Brown's specimen was collected in the Mabira Forest, E. of Kampala.

The species differs from *A. tenerrima* Kraenzl., the type species of the genus, to which it is most closely allied, in the narrower and longer leaves, the rather smaller flowers and in the lateral lobes of the lip being narrow and much shorter than the fleshy middle lobe. In some specimens the flowers are somewhat larger than those described originally, the lateral sepals being nearly 1 cm. long.

LII—NEW TREES AND SHRUBS FROM TROPICAL AFRICA: V.* H. DUNKLEY.

Rinorea Burt-Davyi Dunkley, sp. nov. [Violaceae]; affinis *R. albiflorae* Engl. (inter sectiones *Choriandra* Engl. et *Synandra* Engl.) sed antherarum appendicibus suborbiculatis haud filiformibus, sepalis haud sulcatis, petalis flavis differt.

Frutex; ramuli glabrescentes. *Stipulae* subpersistentes, subulatae, setulosae, 4 mm. longae. *Folia* membranacea, elliptica vel elliptico-lanceolata, usque ad 7.5 cm. longa et 3 cm. lata, basi late cuneata usque inaequaliter rotundata, apice acuminata minutissime mucronata, margine dentibus glandulosis crenato-serrulata, utrinque glabra, nervis venisque elevatis; nervi laterales utrinque circiter 9, arcuati et crebre conjuncti; petiolus breviter pubescens, 3 mm. longus. *Racemi* axillares, puberuli, pauciflori, bracteis concavis ovatis 1 mm. latis muniti; pedicelli puberuli, 5 mm. longi. *Sepala* 5, ovata, obtusa, ciliolata, 1 mm. longa. *Petala* glabra, oblongo-elliptica, apice rotundata, nervosa, 6 mm. longa et 3 mm. lata. *Stamina* 5 libera; filamenta 2 mm. longa. *Antherae* biloculares, basifixae, 1 mm. longae; connectivum suborbiculatum margine fimbriatulum. *Ovarium* glabrum, oblongum, obscure 3-lobatum et sulcatum, 4 mm. longum. *Stylus* glaber, ex toto exsertus, 4 mm. longus stigmatate integro. *Fructus* non visus.

SOUTH TROPICAL AFRICA. Nyasaland: Cholo Mt., 25 Sept. 1929, *Burt Davy* 22182 (type, in Kew Herb.). "In shade."

Rinorea myrsinifolia Dunkley, sp. nov. [Violaceae]; affinis *R. ardisiiflorae* Welw., sed floribus solitariis, antherarum appendicibus longiacuminatis brevioribus, foliis multo minoribus differt.

Frutex; juvenilia primum ferrugineo-tomentella; ramuli mox glabrescentes. *Stipulae* binae, ovatae, 1 mm. longae. *Folia* glabra, lanceolato- vel oblongo-ovata, usque ad 3.5 cm. longa et 1.7

* Continued from K.B. 1935, 265.

cm. lata, basi rotundata vel inaequaliter rotundata, apice obtusa mucronata, margine dentibus apice glandulosis irregulariter crenulata, supra nitida olivaceo-viridia, subtus pallida, nervis venisque utrinque elevatis; nervi laterales arcuati, utrinque 6-9; petiolus tomentellus, 2 mm. longus. Flores solitarii; pedunculi 3 mm. longi, bracteis late ovatis ciliatis 1 mm. longis instructi; pedicelli tomentelli, 5 mm. longi. Sepala 5 ovato-orbiculata, obtusa, extra tomentella, intus glabra, 2 mm. longa. Petala glabra, oblongo-lanceolata, 6 mm. longa et 2.5 mm. lata. Tubus stamineus piloso-marginatus, 1.5 mm. longus. Antherae 2 mm. longae; connectivum longe acuminatum, 4 mm. longum. Ovarium glabrum, subglobosum, 2 mm. diametro. Stylus glaber, exsertus, 5 mm. longus. Placentae 3, uniovulatae. Fructus non visus.

SOUTH TROPICAL AFRICA. Nyasaland: Mangoche Mt., S.E. of Lake Nyasa, 1934, *Clements* 465 (type, in Kew Herb. and Imperial Forestry Institute Herb., Oxford); Mangoche Mt., Nov. 1935, *Clements* 573.

Vernacular name: "Ngalango" (Yao).

***Garcinia mlanjiensis* Dunkley, sp. nov.** [Guttiferae]; affinis *G. polyanthae* Oliv. [sectio *Rheediopsis* Pierre], sed floribus in fasciculo paucis, pedicellis multo brevioribus et crassioribus, filamentorum parte libera valde brevior, foliis minoribus angustioribus differt.

Arbor magna, robusta, ubique glabra; ramuli juniores in sicco sulcati, leviter complanati. Folia coriacea, elliptica vel lanceolato-elliptica vel elliptico-oblonga, usque ad 14 cm. longa, 5.5 cm. lata, apice sensim acuminata, basi cuneata, supra nitidula, subtus opaca lineis resinosis obscuris laxe reticulatis, margine paullum revoluta; nervi laterales numerosi, patentes, supra subprominentes, in nervum submarginalem conjuncti; petiolus supra canaliculatus, sulcatus, tumidus, 1-2 cm. longus. Flores ♂ axillares, glomerati; pedicelli circiter 5-7 mm. longi; bractee late ovatae, 1 mm. latae; bracteolae sub calyce 2, concavae, 2.5 mm. longae. Sepala 4, cucullata, oblongo-orbiculata, 3 mm. longa. Petala 4, suborbiculata, 4 mm. lata. Stamina 32, in phalanges 4 petalis oppositas connata, filamentis complanatis, dimidio superiore liberis [parte libera 1.5 mm. longa], antheris bilocularibus, thecis ovoideis. Flores ♀ et fructus non visi.

SOUTH TROPICAL AFRICA. Nyasaland: Mt. Mlanje, Lichenya Plateau, c. 1950 m., in warm-temperate rain-forest associated with *Canthium Gueinzii* Sond., *Royena lucida* L., *Dasylepis Sereti* De Wild., *Aphloia myrtiflora* Galp., *Lasianthus kilimandscharicus* K. Schum., *Gymnosporia acuminata* Szyszyl., *Ilex mitis* (L.) Radlk., *Olea Welwitschii* (Knohl) Gilg & Schell., etc., *Burt Davy* 22045 (type, in Kew Herb., and Imperial Forestry Herb., Oxford); 22134. Luchenza Plateau, Mlanje Mt., *Topham* 931, 932. "A large vigorous tree."

The same species was collected also on Nchisi Mt. in the interior of warm-temperate rain-forest, c. 1350 m. alt., where it formed the

most common undergrowth, *Burtt Davy* 21244. In this forest it occurred, also, as a tall, straight, cylindrical tree, with trunk 12 to 18 inches diam., associated with *Ficus mallotocarpa* Warb., *F. Kirkii* Hutch., *Trichilia emetica* Vahl, *Bosquiea angolensis* Ficalho, etc. The native names given on Nchisi Mt. were mTundiri (Yao); mSongwe (Chisi), where they were applied also to *G. mbulwe* Engl. Dr. Burtt Davy had no native with him when the Mlanje specimens were collected, so that no native names were obtained for them there.

Cleistanthus Milleri Dunkley, sp. nov. [Euphorbiaceae—Brideleeae]; affinis *C. bipindensi* Pax., sed filamentis liberis, stylis trifidis, et foliis minoribus haud longe caudato-acuminatis differt.

Arbor parva. *Ramuli* teretes, juventute breviter ferrugineo-tomentosi, demum glabrescentes. *Folia* coriacea, glabra, oblongo-elliptica vel obovato-elliptica, usque ad 10 cm. longa, 5 cm. lata, basi rotundata vel late cuneata, apice obtusa breviter acuminata vel rotundata, margine integerrima leviter undulata; costa supra breviter tomentosa; nervi laterales utrinque circiter 8, subtus leviter elevati; petiolus circiter 6 mm. longus, tumidus, tomentosus. *Stipulae* binae, ovatae, acuminatae, 6 mm. longae. *Racemi* axillares, dense ferrugineo-tomentosi, 3 cm. longi, floribus circiter 12 valde proterogynis; bracteae ovatae, 1 mm. longae; pedicelli 6 mm. longi. *Flores* ♂: *Sepala* 5, reflexa, ovato-lanceolata, sub-aequalia, 6 mm. longa 2 mm. lata, intus glabra extra puberula. *Petala* 5, glabra, ligulata vel spatulata, 1 mm. longa. *Discus* irregulariter lobatus, tomentosus. *Stamina* 5, filamentis liberis glabris 2 mm. longis, antheris basifixis 2 mm. longis. *Ovarium* abortivum pilosum, 2 mm. longum. *Flores* ♀: *Sepala* et *petala* ut in floribus ♂. *Discus* ovarium cingens. *Ovarium* subglobosum, pilosum, 3-loculare, 3 mm. diametro. *Ovula* 2 pro loculo, late ovata, complanata. *Styli* 3, pilosi, stigmatibus bilobo. *Capsula* ignota.

SOUTH TROPICAL AFRICA. Northern Rhodesia: Oct. 1932, O. B. Miller D. 158 (type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford). "Small tree, marginal to fringing forest, near source of Mwambeshe stream, alt. 1680 m."

Vernacular name: "muSamvia" (Mambwe).

Drypetes zombensis Dunkley, sp. nov. [Euphorbiaceae]; affinis *D. ugandensi*, a qua ovario cum fructu dense velutino, foliis basi conspicue inaequalibus margine spinoso-dentatis, petiolis ramulisque pubescentibus differt.

Frutex, ramulis leviter sulcatis griseo-pubescentibus. *Folia* glabra, tenuiter at rigide subcoriacea, 12–17 cm. longa, 3–5 cm. lata, elliptica vel lanceolato-elliptica, apice obtuse acuminata, basi conspicue inaequalia rotundata, margine dentibus utrinque circiter 20 regulariter spinoso-dentata, nervis lateralibus utrinque 8–9 intra marginem anastomosantibus supra distinctis subtus leviter elevatis; petiolus supra canaliculatus, tumidus, griseo-pubescent, 8 mm. longus. *Stipulae* minutae. *Fasciculi* unisexuales, ♀ ex

trunco (?) vel ex ramis vetustioribus orientes. *Flores* ♀ pedicellis puberulis usque ad 1.5 cm. longis. *Sepala* 5, inaequalia, orbicularia, 4-6 mm. diametro, glabra, integerrima, marginem versus tomentella. *Discus* ater, undulatus, glaber, inconspicuus. *Ovarium* globosum, circiter 5 mm. diametro, dense velutino-pubescent, 3-loculare, ovulis pro loculo 2. *Stigmata* 3 vel 4, sessilia, subreniformia. *Semina* pro loculo 1. *Flores* ♂ non visi.

SOUTH TROPICAL AFRICA. Nyasaland: Mt. Zomba, Oct. 1929, J. B. Clements 35 (type, in Kew Herb.).

Vernacular name: "muNgunga" (Yao).

Albizzia (Eualbizzia) nyasica Dunkley, sp. nov. [Mimosaceae]; affinis *A. Schimperianae* Oliv., sed floribus subsessilibus, foliolis apice rotundatis, et costa mediana differt.

Arbor circiter 10 m. alta, 25 cm. diametro. *Ramuli* glabri, striati, conspicue lenticellati. *Folia* usque ad 20 cm. longa, 12 cm. lata; petiolus 4-6 cm. longus, sparse puberulus, supra glandula leviter elevata 1 cm. a basi munitus; rhachis circiter 10 cm. longa; pinnae oppositae 6-jugatae; pinnarum rhachides 9 cm. longae, inter foliola terminalia glandulosae, stipellis geminis linearibus minutis. *Foliola* 11-13-jugata, glabra, breviter petiolulata, oblonga, apice rotundata vel breviter mucronata, basi rotundata inaequilateralia, 1.3 cm. longa, 6 mm. lata; costa utrinque elevata; nervi laterales utrinque circiter 5. *Inflorescentiae* pedunculatae, capitatae circiter 30-florae, in ramulis novissimis axillares, plerumque geminatae; pedunculi 2.5-3.5 cm. longi, breviter ferrugineo-tomentosi. *Flores* subsessiles, puberuli. *Calyx* campanulatus, 2 mm. longus, minute deltoideo-dentatus. *Corolla* 5 mm. longa, lobis lanceolato-ellipticis acutis fere dimidium longitudinis attingentibus. *Stamina* circiter 40, primum rosea, glabra, 2 cm. longa, in tubum 3 mm. longum connata; antherae versatiles, minutae. *Ovarium* sparse pilosum, breviter stipitatum. *Stylus* 1.3 cm. longus, glaber. *Legumen* plano-compressum, oblongum, usque ad 20 cm. longum et 4 cm. latum, chartaceum, pustulatum, sparse puberulum; stipes 1.2 cm. longus. *Semina* circiter 10, late ovata, compressa, 1 cm. longa, 8 mm. lata.

SOUTH TROPICAL AFRICA. Nyasaland: Mangoche Mt., Nov. 1935, Clements 574 (type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford); Mangoche Mt., Clements 453, "Tree about 35 ft. high and 10 in. diameter, bark dark grey, smooth, with a few galls up the stem." Clements 454, "Young coppice shoots adjacent to trees from which 453 was obtained." Lake Plains, April 1935, Clements 541.

Vernacular name; "mPirakututu" or "mSilakukutu" (chiNyanja).

Lecaniodiscus Vaughaniae Dunkley sp. nov. [Sapindaceae]; affinis *L. fraxinifoliae* Baker, a qua drupa globosa haud rostrata, foliolis distincte petiolulatis glanduloso-punctulatis, et staminibus regulariter 8 recedit.

Arbor usque ad 10 m. alta, ramulis striatis prominenter lenticellatis minute furfuraceis. *Folia* exstipulata, circiter 5-jugata, 20–30 cm. longa, 10–15 cm. lata; petiolus circiter 4 cm. longus, basi tumidus; rhachis 10 cm. longa, internodiis 1.5–3 cm. longis. *Foliola* subopposita, glabra, dense glanduloso-punctulata, lanceolato-vel ovato-elliptica, 5–7 cm. longa, 2–3 cm. lata, basi inaequalia rotundata vel late cuneata, apice obtusa; costa supra paullum impressa, subtus conspicue elevata; nervi laterales utrinque 10–12; petiolulus 3–4 mm. longus, tumidus. *Racemi* axillares, puberuli, usque ad 7 cm. longi; pedicelli 4 mm. longi, fasciculati, fasciculis 3–5-floris. *Flores* ♂: *sepala* 3, deltoideo-ovata, 3 mm. longa; *petala* 0; *discus* glaber, irregulariter 5-lobatus; *stamina* 8, filamentis glabris, antheris dorsifixis; *ovarium abortivum* pilosum. *Flores* ♀: *sepala* 4–5; *petala* 0; *stamina* 8; *ovarium* globosum, molliter velutinum, stigmatibus sessilibus 3-lobato. *Fructus* subglobosus, 1 cm. diametro; stylus et calyx fructu persistentes; *semen* erectum, testa crustacea brunnea rugosa.

EAST TROPICAL AFRICA. Zanzibar: J. H. Vaughan 2301 (type, ♂ in Kew Herb.); Vaughan 2178 (with fruits, ♀). "A tree up to 40 ft." (In Kew Herb., Brit. Mus. Herb., and Imperial Forestry Institute Herb., Oxford).

***Bersama zombensis* Dunkley, sp. nov.** [Melianthaceae]; affinis *B. maximae* Baker, sed stylo brevior, staminibus haud monadelphis, petalis et foliorum pagina inferiore haud glabris, foliolis integris recedit.

Arbor magna, fere omnino dense ferrugineo-tomentosa, ramulis fortiter striatis. *Folia* imparipinnata, 5–8-jugata, usque ad 30 cm. longa et 15 cm. lata; stipulae intrapetiolares 6 mm. longae, ovatae vel lanceolato-ovatae, caudato-acuminatae; petiolus 3–4 cm. longus, basi tumidus, supra canaliculatus; rhachis 15–18 cm. longa, conspicue alata, supra praeter floccos interpetiulares glabra, internodiis plerumque 2.5–3 cm. longis. *Foliola* opposita, oblongo-elliptica, elliptico-lanceolata, vel nonnunquam obovata, 5–9 cm. longa, 2–3.5 cm. lata, basi rotundata vel late cuneata et breviter decurrentia, apice late acuta vel obtusa, supra glabra nitida, subtus dense et molliter aureo-pubescentia, margine integra; costa supra paullum impressa, subtus conspicue elevata; nervi laterales utrinque 11; petiolulus circiter 2 mm. longus, fortiter canaliculatus. *Racemi* prope apicem ramulorum axillares, usque ad 18 cm. longi, 200–300-flori; pedunculus conspicue striatus, 6 cm. longus; pedicelli 3–4 cm. longi, bracteis filiformibus 4 mm. longis. *Calyx* extus dense tomentosus, intus glaber, persistens; lobi 5 (2 connati), subaequales, 6 mm. longi, 3 mm. lati, ovati, apice acuti, basi connati. *Petala* 5, reflexa, oblongo-ligulata, breviter sericea; unguiculi 7 mm. longi; anticorum lamina 1 cm. longa et 5 mm. lata, posticorum 1.5 cm. longa et 2.5 mm. lata. *Stamina* 4, filamentis 1.5 cm. longis per paria connatis basi pilosis, antheris basifixis 3 mm. longis. *Discus* 2-lobatus, incompletus, glaber. *Ovarium* pilosum, 4–5-loculare; stylus

crassus, 7 mm. longus, stigmatе globoso 5-lobato. *Ovulum* pro loculo 1, erectum. *Fructus* lignosus, ovoideo-globosus, obscure 4-5-valvatus, ad 2.5 cm. longus, 1.5 cm. latus, dense et molliter roseo-tomentosus, stylo persistente terminatus. *Semina* 3, oblongo-elliptica, 5 mm. longa, 3 mm. lata.

SOUTH TROPICAL AFRICA. Nyasaland: Zomba district; *Clements* 503 (type, in Kew Herb. and Imperial Forestry Institute Herb., Oxford). Zomba district, *Clements* 334, 406 (with fruits), 577. "A very large tree, stream-banks only, good timber." Dec. 1935. Vernacular name: "mChinji" (Yao).

***Lannea Stuhlmannii* Engl. var. *tomentosa* Dunkley, var. nov.** [Anacardiaceae]; a typo differt ramulis paniculis et foliis conspicue et longe stellato-pilosis, foliis saepe 4-jugis.

SOUTH TROPICAL AFRICA. Northern Rhodesia: Bombwe, *Martin* 357 (type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford); 30 Nov., 1932, *Martin* 406, "A large tree." Mazabuka, *Stevenson* 142/30, 445/32, 483/33. Southern Rhodesia: Matopos, *Eyles* 6623, "Large tree, bark peels"; Gatooma Commonage, alt. 1140 m., *Eyles* 7262, "Tree on sand veld." Vernacular names: "muOnga" (Chila), "muBumbu" (Chitoka and Sikololo).

***Solanum Burt-Davyi* Dunkley, sp. nov.** [Solanaceae]; affinis *S. acanthocalyci* Klotzsch, sed partibus omnino pilis urentibus ferrugineo-stellatis longe stipitatis obtectis facile distinguitur.

Frutex lignosus, scandens. *Ramuli* subflexuosi, cum petiolis et pedunculis dense ferrugineo-stellati, aculeis recurvatis pallide stramineis 4 mm. longis. *Folia* alterna, irregulariter ovata, nonnunquam obscure pinnatiloba, usque ad 8 cm. longa, 3.5 cm. lata, basi inaequalia rotundata vel irregulariter truncata, apice acuta vel acuminata, supra olivacea, pilis stellatis albidis brevibus rigide atque dense scabridiuscula, subtus pallide fulvo-cinerea, pilis stellatis albidis longe stipitatis dense et pilis ferrugineis sparse obiecta, margine pilis rubris stellatis longe stipitatis dense ciliato; nervi laterales utrinque 5-6, supra paullum impressi, subtus elevati; *petiolus* usque ad 3 cm. longus. *Cymae* terminales, 3-5-florae; *pedunculus* aciculatus, circiter 2 cm. longus. *Flores* violacei; *alabastra* ovata, acuta, aciculis sat rectis stramineis conspicue armata. *Sepala* 5, elliptico-ovata, 1.5 cm. longa, 5 mm. lata, apice longe acuminata, intus glabra prominenter costata. *Corolla* ad basin partita; *lobi* 5, oblongo-ovati, apice late acuti, extus tomentosi, intus praeter costam elevatam tomentosam glabri. *Stamina* inter se aequalia, *filamentis* brevissimis, antheris oblongis 6 mm. longis. *Ovarium* subglobosum, stellato-pilosum, 2-loculare; *stylus* erectus, cylindricus, glaber, stigmatе minuto obscure bilobato. *Fructus* haud visus.

SOUTH TROPICAL AFRICA. Nyasaland; Mt. Nchisi Rain Forest, Sept. 4th, 1929, *Burt Davy*, 21193 (type, in Kew Herb.). "A climber in shade, by stream: hairs irritant; large purple and yellow flowers."

LIII—NOTES ON CAREX: II.* E. NELMES.

NEW SPECIES FROM EAST TROPICAL AFRICA.

Among the sedges collected by Dr. George Taylor on the British Museum Expedition to East Tropical Africa in 1934-35, are two new species of *Carex* belonging to the section *Pseudocyperae* Tuckerm. This group, though containing few species, has representatives in most temperate and subtropical parts of the world. The commonest species, *C. Pseudocyperus* itself, occurs all round the northern hemisphere, and varieties of it are found in Australasia and South America, but its relatives in tropical and south Africa are specifically distinct.

The two new African species, which I have called *C. Taylorii* and *C. pseudo-sphaerogyna*, have utricles with the rather shorter and broader beaks and straighter teeth of the South African species, *C. cognata* Kunth, and the central African *C. congolensis* Turrill. *C. Taylorii* presents, in its rich chocolate coloured spikes, a striking contrast to most other members of the section, which are markedly yellowish in colour. It has a long scabrid awn, and stands almost alone in its group by reason of the scabrous-ciliate beak to the utricle, and in having the scabridity of the awn running half-way down the three nerves on the back of the glume. *C. pseudo-sphaerogyna* looks superficially remarkably like the Mascarene *C. sphaerogyna* Baker, but close examination proves it to be nearer to Turrill's *C. congolensis*.

Carex Taylorii Nelmes, sp. nov.; affinis *C. cognatae* Kunth, sed spicis chokolatineis, squamarum aristis longissimis, utriculis suberectis, rostris latioribus brevioribus et parce scabro-ciliatis differt.

Culmi 1 m. alti, validi, angulis acutis superne scabris. *Folia* 1 cm. lata, plana, supra et marginibus scabra, superiora inflorescentiam longe superantia; vaginae basilares reticulatim fissae, in statu juvenali rubro-brunneae. *Spicae* 6, 4-5 cm. longae, infima remotiuscula excepta approximatae, cylindricae, chokolatinae, terminalis mascula breviter pedunculata, laterales femineae, crassae, densiflorae, inferiores breviter, superiores brevissime pedunculatae. *Bractee* evaginantes, inferiores late foliaceae, inflorescentiam longe superantes, superiores tenuiter foliaceae. *Squamae* 3-3.5 mm. longae (arista exclusa), oblongo-ellipticae, chokolatinae, nitidae, apice ciliatae, supra medium nervis tribus scabrae, in aristam planam longissimam (4-6.5 mm.) scabro-ciliatam sensim excurrentes. *Utriculi* 4 mm. longi, 2 mm. lati, ovato-elliptici, membranacei, suberecti, subinflati, compresso-trigoni, inferne straminei, superne chokolatini maculati nitidi, 6-8-nerves, breviter et valde stipitati, marginati, in rostrum mediocre latum planiusculum profunde bidentatum (dentibus strictis) marginibus parce scabro-ciliatis sensim

* Continued from K.B. 1937, 355.

desinentes. *Nux* laxe inclusa, oblonga, trigona, faciebus concavis. *Stigmata* 3.

KENYA COLONY: Naivasha District; Aberdare Mountains, Kinangop, in marsh, with 1354, *C. Petitiana* A. Rich., 3000 m., fr. 27 Oct. 1934, *G. Taylor* 1354a.

Carex pseudo-sphaerogyna *Nelmes*, sp. nov.; affinis *C. congolensi* Turrill, sed foliis angustioribus, spicis minoribus, utriculis tenuioribus brevioribus tenuiter nervatis, nucibus minoribus differt.

Culmi 40–52 cm. alti, angulis acutis superne scabris. *Folia* 4–5 mm. lata, pallida flavo-viridia, planiuscula, longe attenuata, marginibus minute scabra, superiora inflorescentiam superantia; vaginae pallidae, basilares parce reticulatim fissae. *Spicae* 4–5, plerumque 5, 2.5–3 cm. longae, brevissime pedunculatae, infima remotiuscula excepta approximatae, brunneae, terminalis mascula lineari-cylindrica, laterales femineae cylindricae, subdensiflorae. *Bractaeae* foliaceae, evaginantes, inferiores inflorescentiam longe superantes, superiores tenuiter foliaceae. *Squamae* oblongo-ellipticae, subhyalinae, vitta mediana pallide viridi-brunnea, trinerves, apice ciliatae, 2 mm. longae (arista exclusa), in aristam 1.5–2 mm. longam planam scabro-ciliolatam excurrentes. *Utriculi* 3.5 mm. longi, 1.3 mm. lati, elliptici, membranacei, suberecti, subinflato-trigoni, brunnei, 6–8-nerves, angustissime marginati, brevissime stipitati, in rostrum mediocri laeve latiusculum bidentatum (dentibus strictis vel vix divergentibus) sensim desinentes. *Nux* laxe inclusa, oblongo-elliptica, trigona, faciebus concavis, pallida. *Stylus* tortuosus, basi subincrassatus. *Stigmata* 3.

UGANDA: Kigezi District; Virunga Mountains, north-west end of Lake Bunyoni, on margin of swamp, fr. 27 Nov. 1934, *G. Taylor* 2146.

LIV—PLANTS NEW TO ASSAM: IX.* C. E. C. FISCHER.

The regions shown in brackets after the name of each species are those from which it has been previously recorded.

Clematis Meyeriana *Walp.* [Ranunculaceae].

(China).

Naga Hills: Khegwo, 4000 ft., *N. L. Bor* 2854; Nimi, 4500 ft., fls. sweet-smelling, March, *N. L. Bor* 2881.

Aconitum Elwesii *Stapf* [Ranunculaceae].

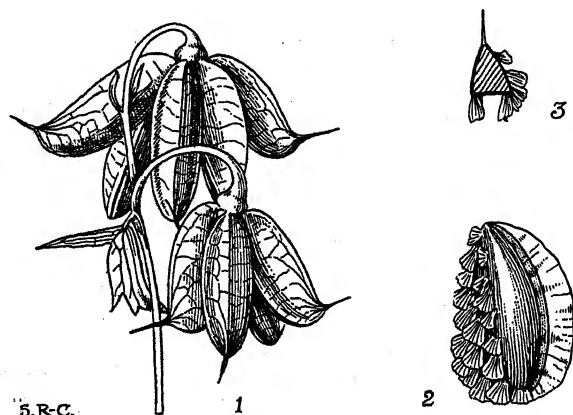
(Sikkim).

This is the *A. uncinatum* Hook. f. et T. in Fl. Brit. Ind., but not of Linn.

Naga Hills: Rangkhū Pass, Chingkhū, 8800 ft., frt. (flowers just over) Nov., *N. L. Bor* 6778. The follicles being unknown, the following details derived from this specimen are given:

* Continued from K.B. 1936, 286.

Follicles nearly glabrous in maturity, 1.6-2 cm. long, 5-7 mm. wide; compressed, strongly reticulately veined; style horizontal. *Seeds* oblong, wedge-shaped in section, black, 3.5-4.5 mm. long, 2-4-3 mm. wide, winged along the raphe, the other edge furnished with hyaline lammellae.



Aconitum Elwesii Stapf. 1, end of rhachis with fruit, nat. size; 2, seed, lateral view, $\times 6$; 3, seed, transverse section, $\times 6$.

Podophyllum aurantiocaula *Hand.-Mazz.* [Berberidaceae].
(Yunnan).

Delei Valley, 10,000 ft. in conifer forest, fls. white, May, *F. Kingdon Ward* 8265.

In K. B. 1929, 249, this same specimen was erroneously quoted as *P. versipelle* Hance, but it is actually the above species.

Uraria hispida *Schindl.* [Papilionaceae].
(Yunnan).

Naga Hills: Themokedima, 4500 ft., fls. pink Sept., *N. L. Bor* 6173. A shrub.

Pottingeria acuminata *Prain* [Hydrangeaceae].
(N. Burma and Yunnan).

Naga Hills: Nimi, 4500 ft., fls. March, *N. L. Bor* 2882, "a small shrub."

Oxyspora serrata *Diels* [Melastomataceae].
(N. Burma and Yunnan).

Naga Hills: Khonoma, 6000 ft., fls. mauve, July, *N. L. Bor* 6334, "a shrub."

Quercus Engleriana *Seem.* [Cupuliferae].
(China).

Delei Valley: Chibaon, 28° 10' N: 96° 30' E, 6000-8000 ft., *F. Kingdon Ward* 8053, "a large evergreen tree of the rain forest";

Delei Valley, 28° 21' N. : 96° 37' E., 9000 ft. and under, *F. Kingdon Ward* 8305, "a large, tall, evergreen tree with unbranched trunk and a big spreading crown of branches at the summit; scattered in the *Tsuga-Rhododendron* forest, sometimes 2 or 3 together. The only *Quercus* to ascend so high and not common; possibly commoner lower down."

***Dioscorea kamoonsensis* Kunth var. *staminea* Prain et Burk.**
[Dioscoreaceae].

(N. Burma, W. China and Siam).

Naga Hills: Paona, 5500 ft., fls. Sept., *N. L. Bor* 6265.

***Carex mercarensis* Hochst.** [Cyperaceae].

(S. India).

Naga Hills: Ridima, 5800 ft., fls. & frt. April, *N. L. Bor* 2763.

***Carex teres* Boott** [Cyperaceae].

(Sikkim).

Naga Hills: Zekwera, 6000 ft., in a marsh, fls. April, *N. L. Bor* 2737.

LV—EPIPOGUM OR EPIPOGIUM.

T. A. SPRAGUE and M. L. GREEN.

The name of this genus has been spelt in four different ways since 1753, namely, *Epipogium*, *Epipogum*, *Epipogon* and *Epipogion*.

According to International Rules, Art. 70, the original spelling must be retained except in the case of a typographic or clearly unintentional orthographic error. The words "original spelling" in this article mean the spelling employed when the name was validly published.

At the time when the *Index Kewensis* was prepared the starting-point for nomenclature of genera was not 1753, but 1735, the date of publication of Linné's *Systema Naturae*, ed. 1. Hence the name *Epipogum* S. G. Gmel. (1747) was adopted in the *Index*.

Ehrhart, *Beiträge*, 4, 148 (1789) altered the spelling to *Epipogium*, but as indicated in International Rules, Art. 67 (3), this and certain other names published by Ehrhart, which resemble generic names, are actually "unitary designations of species," and must be rejected unless they have been published as generic names by a subsequent author.

The spelling *Epipogum* was adopted by L. C. Rich. in *Mém. Mus. Par.* 4, 42, 50 (1818). This was "corrected" to *Epipogon* by Ledebour, *Fl. Ross.* 4, 77 (1853), and to *Epipogion* by St.-Lager in *Ann. Soc. Bot. Lyon*, 7, 144 (1880).

Pfeiffer's *Nomenclator*, 1, 1222 (1874) cites Sprengel, *Anleit.* 2, Abth. 1, 285 (1817) as having adopted the name *Epipogium* Ehrh. (1780). Reference to Sprengel (l.c.), however, showed that he

attributed *Epipogium* to Robert Brown, and the first valid publication of this name has now been traced to R. Br. Prodr. 330, 331 (1810). There it is unaccompanied by a description, but *Epipogium* is attributed by Robert Brown, on p. 331, to Gmelin, who gave a generic description under the spelling *Epipogum* (Fl. Sibir. 1, 11 : 1747). The citation of Gmelin by Robert Brown is an *implicit* reference to Gmelin's previously and effectively published description, and accordingly validates the name *Epipogium* R. Br. under International Rules, Art. 37. References to the places of publication of the various spellings are given below.

Epipogium R. Br. Prodr. 330, 331 (1810) ; Sw. Summa Veg. Scand. 32 (1814) ; Spreng. Anleit. 2, Abth. 1, 285 (1817).

Epipogum L. C. Rich. in Mém. Mus. Par. 4, 42, 50 (1818).

Epipogon Ledeb. Fl. Ross. 4, 77 (1853).

Epipogion St.-Lag. in Ann. Soc. Bot. Lyon, 7, 144 (1880).

[*Epipogum* Gmel. Fl. Sibir. 1, 11 (1747).]

The case of *Epipogium* illustrates the point that, under the International Rules, the citation of a previously and effectively published description of a genus need not include a precise reference to its place of publication, so long as there is no reasonable doubt as to the work intended.

LVI—MISCELLANEOUS NOTES.

IVAN K. URUMOFF.—We record with deep regret the death of the veteran Bulgarian botanist, Ivan K. Urumoff, on October 9th, 1937, at the age of 81.

Urumoff belonged to the older generation of Bulgarian botanists, much of whose work was accomplished under conditions of extreme difficulty. He was born in 1856 and well remembered the last years of Turkish domination in Bulgaria. After studying at Heidelberg, Urumoff returned to his own country and threw himself with enthusiasm into investigating the native flora. The absence of any Flora or manual of Bulgarian plants till the appearance of Velenovský's "Flora Bulgarica" in 1890, and the extreme poverty of botanical literature of all sorts, led him to seek help from foreign botanists in determining much of his material. His first botanical publication appeared in 1897 under the title "Materialien zur Flora des Loveč-Bezirkcs," and enumerates 1200 plants of which 30 were new to the Bulgarian flora. Since that date he published over 60 papers on Bulgarian plants, in German and Bulgarian. He described about 30 new species and many new subspecies and varieties. Some of these have since become well-known garden plants—as *Haberlea Ferdinandi-Coburgi*. About 20 other species and varieties found by him were described as new by other botanists. He was also an authority on Bulgarian folk-medicine.

Like many Bulgarians, Urumoff was a strong healthy long-lived man of a fine presence and with an attractive personality. The writer well remembers visiting him at his charming house in Sofia

in 1922, when he was still at the high level of his physical and mental powers. An enthusiastic and true lover of nature, he was one of the energetic band of investigators who, later with the patronage of Prince (afterwards Czar) Ferdinand and still later that of King Boris, did so much to make the rich flora of Bulgaria known to their fellow botanists. Since the first botanists of modern times to visit Bulgaria were Englishmen (Sibthorp, Clarke) it is appropriate that an appreciation of Urumoff's work should appear in the Kew Bulletin.

W. B. TURRILL.

Pterocarpus Draco L.: *addenda et corrigenda*.—The question of the valid publication of, authority for and type species of the generic name *Pterocarpus* (cf. Kew Bull. 1937, 63) presents some curious anomalies and complexities.

The first appearance of the name in botanical literature is in Linnaeus, Fl. Zeyl. 196 (1748), where references are given to Commelin, Ray, Burman and Hermann, and a generico-specific description, but no specific phrase-name, is provided. Linnaeus referred the plant to the *Diadelphina*, among the *Obscurae*—"Plantae, quarum fructificatio parum, nec sufficienter, cognita," but expressed a doubt whether it should not rather be placed in the *Decandria**. The name occurs also, again as a uninominal, in Linn. Mat. Med. 184 (1749), for the plant producing the officinal resin *Sanguis Draconis*.

The first† author to employ *Pterocarpus* as a generic name under the Linnean binary system was Jacquin, Sel. Stirp. Amer. Hist. 283 (1763). In that place the name appears as follows:

PTEROCARPUS.

1. PTEROCARPUS (*officinalis*.) TAB. CLXXXIII. Fig. 92.
Linn. mat. med. 522.
Lingoum. Rumpf. 2. p. 205 t. 70?

This is followed by a long specific description‡ (flowers and fruit were, however, unknown); notes on economic and medicinal uses; the vernacular name *Sangre de Dragon*, applied to the resin; and the habitat, "in sylvaticis insulae Tierra Bomba [Cartagena, Colombia]. Conjicio florere Decembri."

Under Art. 42 of the International Rules, a generic name is validly published if "accompanied by the citation of a previously and effectively published description of the genus under another name." Jacquin's reference to Linn. Mat. Med. constitutes an indirect citation, since Linnaeus there refers back to his Fl. Zeyl. where a description of *Pterocarpus* was "previously and effectively"

* Cf. also his footnote in Syst. Nat. ed. 12, 2, 473 (1767).

† Cf. Kew Bull. 1937, 64, footnote*.

‡ For the valid publication of specific epithets anteriorly to that of the corresponding generic name, see Sprague & Riley in Journ. Bot. 62, 7 (1924); Sprague & Hubbard in Kew Bull. 1933, 15; Hubbard in Kew Bull. 1936, 319.

published. It might seem, therefore, at first sight, that this generic name should, under the Rules, be ascribed to [L.] Jacquin.

Investigation of the Mat. Med. and Fl. Zeyl. references reveals, however, that so many discordant elements were involved that it will be desirable to treat the name *Pterocarpus* [L.] Jacq. as a *nomen confusum* (see Art. 64). The plant figured and described by Commelin and Ray was certainly *Pterocarpus indicus*. But the plant referred to by Hermann and Burman has been definitely identified by Trimen (in Journ. Linn. Soc. 24, 154 : 1887 ; Handb. Fl. Ceyl. 2, 93 : 1894 ; cf. O. Kuntze, Rev. Gen. Pl. 1, 202 : 1891) as *Derris uliginosa* Benth., and Linnaeus apparently drew up his description of *Pterocarpus* in the Fl. Zeyl. from Hermann's specimens of that species. Moreover, *P. indicus* does not occur in Ceylon, the only species there being *P. Marsupium* Roxb. Finally, the source of the actual resin *Sanguis Draconis* of the Materia Medica was the palm *Daemonorhops*.

Thus Linnaeus was confusing four species belonging to three genera and two distinct families. *Pterocarpus* [L.] Jacq. is accordingly proposed for addition to the list of *nomina confusa* forming Appendix V of the International Rules (see Art. 64).

The first unambiguous application of the name *Pterocarpus* dates from Linn. Gen. ed. 6, 366 (1764). Linnaeus published it as "PTEROCARPUS. authore Loefflingio," and it is evident from a comparison to the description was almost entirely compiled from Loeffling's *Draco arbor* and *Sanguis draconis** in his Iter Hisp. 266, 273 (1758). These, of course, were of South American origin.

This fact was, unfortunately, overlooked by the writer when drawing up the note on *P. Draco* L. in Kew Bull. 1937, 63, and he is indebted to Messrs. E. J. H. Corner and C. X. Furtado, of Singapore, for drawing his attention to it. In their words, "since *Pterocarpus* as published by Linnaeus was a monotypic genus and since the generic description was based on the American plant, one is justified in interpreting the species, *P. Draco* L., by reference to an American plant." It becomes especially desirable to do this in view of Linnaeus's own subsequent treatment of it. In Mant. Pl. Alt. 438 (1771) he writes : "Divide Synonyma cum asiatica, quae videtur diversa Species ab americana." In Schreber's edition of the Mat. Med., p. 169 (1773), the reference to Commelin is replaced by L. Sp. Pl., Jacq. Hist. and Loeffl., and *Lingoum* Rumph. is treated as a variety β . The habitats are given as : " α America meridionalis ; β India orientalis, Java."† The following note is added :

* It is interesting to note that Loeffling recognized this as distinct from the Old World plant : "I find that our *Sanguis Draconis Occidentalis* is of the same [genus], as [*Sanguis Draconis*] *Orientalis*; but a different species. . ." (l.c. 273).

† In the 13th edition of Linn. Syst. Veg., p. 533 (1774), Murray remarks under *P. Draco* : "Forte orientalis et occidentalis distinctae species." This note was repeated by himself and Persoon in successive editions of the Systema, but it was left to Willdenow to provide a binary name for the eastern plant.

"*Sanguis Draconis* a variis arboribus praeparari fertur; ex hac, Calamo & Dracaena." The *Calamus* was certainly *Daemonorhops* spp.

It was no doubt this omission by Schreber of the Commelin reference, and the treatment of the Rumphian plant as a distinct variety, that led Willdenow to make the latter the basis of his new species *Pterocarpus indicus* (Sp. Pl. 3, 904: 1803). He, however, unaccountably reintroduced the Commelin reference under *P. Draco*, the "Amerianische Flügelfrucht," instead of under the Asiatic species.

To sum up: the name *Pterocarpus* was originally based by Linnaeus on specimens of *Derris uliginosa* from Ceylon, which he erroneously identified with Commelin's figure of *Pterocarpus indicus* originating from Java. Both plants had superficially similar winged fruits. Owing to the occasional employment of *Pterocarpus* resin as a substitute for the genuine officinal *Sanguis Draconis*, the true source of which was apparently unknown to them, Jacquin and Linnaeus gave the specific epithets *officinalis* and *Draco* in the belief that *Pterocarpus* produced the true *Sanguis Draconis* of commerce. Reference to any standard pharmaceutical work reveals that the actual source of this was *Daemonorhops Draco* and other East Indian palms.*

As employed for the last 170 years, however, the generic name *Pterocarpus* is typified by an American plant, and is associated with the unequivocal generic and specific descriptions of [Loefling apud] Linnaeus (Gen. Pl. l.c.) and Jacquin, respectively.

H. K. AIRY-SHAW.

Cacao Fermentation†.—The Cacao producer is in a much better position to know the market requirements for his product than is the producer of coffee, tea and other crops used extensively as beverages and stimulants. The reason for this is that, in the main, cacao beans are treated as an unmanufactured product and are purchased by large manufacturers, who convert these into cocoa, chocolate, etc. Such manufacturers are therefore in a position to know and state exactly what they require.

The author shows that, though cacao beans resembling in appearance the fermented bean can be and have been prepared experimentally without fermentation, such beans, when roasted, lack both flavour and aroma and it is made clear that, as far as experience goes, some degree of fermentation is essential in the preparation for the market of all varieties of cacao beans.

The author has rendered a valuable service to all cacao producers by bringing together and assessing the literature dealing with the science and practice of cacao fermentation. No one is

* For help in this connexion I am indebted to Dr. T. A. Sprague.

† By Arthur W. Knapp, M.Sc., F.I.C., M.I.Chem.E., Chief Chemist, Messrs. Cadbury Bros., Ltd. A Contribution from the Laboratories at Bournville. London: John Bale, Sons and Curnow, Ltd., 1937. Price 10s.

better qualified to write such a monograph than Mr. Knapp, whose practical and experimental knowledge of this operation, coupled with his experience in the manufacture of chocolate and cocoa, render him peculiarly fitted for this task.

The work will serve as a most useful guide to those whose interests lie in the improved quality of the cacao of commerce. The scientific basis of fermentation is explained, but no hard and fast rules are possible since fermentation is affected not only by the kind of cacao grown, but also by the environment.

H. C. SAMPSON.

A Note-Book of Tropical Agriculture.*—A second edition of this useful little book of reference, which was first published in 1933, has now been issued. It is modelled somewhat on the lines of McConnell's "Agricultural Note-Book of Facts and Figures," which is doubtless familiar to all agricultural students and many agriculturists in Great Britain, and is designed to serve a similar purpose for those concerned with tropical agriculture.

The book is interleaved, which adds to its usefulness, but one could wish that it had been bound a little more securely, especially as it will be used mainly in the tropics.

Weeds, Weeds, Weeds†.—Sir Charles Boys, F.R.S., is well known to visitors to Kew as the maker and donor of the unique sundial in Cambridge Cottage Garden, and to the scientific world as a physicist of rare ingenuity and distinction, but he emerges in his 83rd year as a friend to the gardener in his amusingly-written booklet "Weeds, Weeds, Weeds."

Sir Charles has obviously made a careful study of the habits of our common persistent weeds, such as plantains, bindweed, thistles and the like, and his suggestions for their eradication are based on his own practical experience, aided, as one would expect, by his ingenuity both in tool-making and in the employment of the cheapest and most effective chemical substances. We commend the book to all gardeners who suffer from these pests.

* Compiled by R. Cecil Wood, M.A., Dip. Agric. Cantab. Published by the Imperial College of Tropical Agriculture, Trinidad, 1937. Copies obtainable on application to the Editor, "Tropical Agriculture," Imperial College of Tropical Agriculture, Trinidad (price 5s., post free: 5s. 3d., post free, to foreign countries).

† By Sir Charles V. Boys, LL.D., F.R.S., etc. Published by The Old Westminster Press, Wightman & Co., Ltd., Regency Street, London, 1937. Pp. 69. Price 1s. (by post 1s. 2d.).

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BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1937 ROYAL BOTANIC GARDENS, KEW

LVII—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: XX.* E. M. MARSDEN-JONES AND W. B. TURRILL.

THE GENETICS OF AN AUSTRIAN MOUNTAIN PLANT.

INTRODUCTION.

The breeding described in this paper involves a plant collected by the late O. Stapf, in a dry river bed, Echarn Tal bei Hallstatt, Upper Austria, 1927, at a little over 700 m. Since this plant has not yet been exactly matched with any other described species or variety it is here referred to as C.1 without any commitment as to its exact status. This can only be determined when our planned *Silene* researches are nearing completion.

In this paper the following families are analyzed:—

N. 50. C. 1 \times B. 11.

N. 48. B. 11 \times C. 1.

N. 41. A. 2 \times C. 1.

N. 66. N. 41 plant 7 selfed.

N. 84. N. 41 plant 9 selfed.

N. 45. A. 15 \times C.1.

N. 63. N. 45 plant 15 selfed.

N. 64. N. 45 plant 35 selfed.

N. 73. N. 45 plant 31 selfed.

N. 51. C. 1 \times A. 21.

N. 77. N. 51 plant 1 selfed.

N. 85. N. 51 plant 6 selfed.

A comparative description of C.1 follows immediately below the next paragraph. The other stock-plants used in the experiments described in this paper have been described in the following places:—

B.11, K.B. 1931, 121.

A.2, K.B. 1928, 4.

A.15, K.B. 1929, 151.

A.21, K.B. 1937, 45.

In this paper, besides the exceptional interest of studying the genetical interactions of a Central European mountain plant with British plants of *S. vulgaris* and *S. maritima*, the occurrence of coloured petals introduces a set of characters not previously described by us. The following symbols are used for flower colour:—

D (deepest) upper surface Pale Rosolane Purple (Ridgway, Pl. 26); lower surface Eupatorium Purple (Ridgway, Pl. 38).

* Continued from K.B. 1937, 436.

M (medium) upper surface Pale Laelia Pink (Ridgway, Pl. 38) ; lower surface Tourmaline Pink (Ridgway, Pl. 38).

P (pale) upper and lower surface very diluted Pale Laelia Pink, in the veins often Pale Laelia Pink.

D 1 upper surface Hellebore Red (Ridgway, Pl. 38) ; lower surface Deep Hellebore Red (Ridgway, Pl. 38).

M 1 upper surface Pale Laelia Pink ; lower surface diluted Eupatorium Purple.

P 1 upper surface very diluted Pale Laelia Pink ; lower surface Pale Laelia Pink, veined Tourmaline Pink.

P 2 upper surface white, lower surface tinged Pale Laelia Pink.

W both surfaces white.

STOCK-PLANT DESCRIPTION.

C. 1. *Habit* semi-prostrate, stems up to 3.3 dm. long, more or less ascending at the flowering ends, no barren shoots ; medium amount of anthocyanin in vegetative parts.

Leaves narrowly lanceolate, 2.1 cm. long, 0.4 cm. broad, acute, margins ciliolate, dark green.

Inflorescence of 1 to 3 flowers, flowers nodding and zygomorphic ; bracts ciliate.

Calyx ovoid cylindric in flower, becoming ellipsoid in fruit, much anthocyanin.

Corolla with the petals and segments not contiguous or overlapping ; diameter 1.3 cm. Petals 1.4 cm. long, 0.4 cm. broad, lamina bilobed, divided $\frac{3}{4}$ its length, small scale, colour M.

Androecium fully developed, flowers hermaphrodite. Filaments purple ; anthers purple.

Gynoecium with purplish stigmata and white immature seeds.

Ripe capsules obloid, without the teeth 5 mm. long, 6.5 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at base, strongly recurved ; carpophore 2 mm. long, 2 mm. broad. The capsules are essentially of the *S. maritima* type.

Mature seeds armadillo.

CROSSES INVOLVING C.1 AND S. VULGARIS.

N. 50. C.1 \times B.11. 1 plant in the family.

Habit : more or less erect, stems up to 5.5 dm. high, medium amount of anthocyanin in vegetative parts.

Indumentum : medium.

Leaves : intermediate between the parents in shape.

Inflorescence : 9-18 flowers, slightly drooping and slightly zygomorphic.

Calyx : inflated, with much anthocyanin.

Corolla : colour P ; petals and segments not contiguous or overlapping ; petals bilobed, more than $\frac{3}{4}$; very small scale ; no blotch.

Sex : hermaphrodite.

Anthers : purple ; filaments purple.

Stigmata : purple ; immature seeds white.

Mature capsules : intermediate between the two parents.

Mature seeds : armadillo.

Completely died down in winter, with no barren shoots.

N. 48. B.11 \times C.1. 1 plant in the family.

Habit : more or less erect, stems up to 4 dm. high, medium amount of anthocyanin in vegetative parts.

Indumentum : medium.

Leaves : intermediate between the parents in shape.

Inflorescence : 15 to 27 flowers, slightly drooping and slightly zygomorphic.

Calyx : inflated, with medium anthocyanin.

Corolla : colour P ; petals and segments not contiguous or overlapping ; petals bilobed, more than $\frac{3}{4}$; boss ; no blotch.

Sex : female.

Stigmata : purple ; immature seeds white.

Mature capsules : intermediate between the two parents.

Mature seeds : tubercled.

Completely died down in winter, with no barren shoots.

CROSSES INVOLVING C.1 AND S. MARITIMA.

N. 41. A.2 \times C.1. 51 plants in the family.

Habit : of all plants, semi-prostrate ; stems up to 4.5 dm. long ; green with a little anthocyanin in vegetative parts ; all with some overwintering barren shoots.

Indumentum : glabrous.

Leaves : uniformly intermediate between the parents.

Inflorescence : 3 to 7 flowers, slightly drooping and slightly zygomorphic.

Calyx : in all broadly ellipsoid ; with much anthocyanin.

Corolla : colour 45 M : 6 P ; neither petals nor segments overlapping, except 9 with segments overlapping ; petals in all bilobed, except 3 with some multilobing, in all $\frac{3}{4}$ lobing ; 3 small scale : 48 scale ; 38 with blotch : 13 with no blotch.

Sex : 27 hermaphrodite : 10 hermaphrodite and female : 14 female.

Filaments : 31 purple : 6 white ; anthers 37 purple.

Stigmata : 49 purple : 2 white ; immature seeds all purple.

Mature capsules : all of *S. maritima* type.

Mature seeds : all armadillo.

N. 66. N. 41 plant 7 selfed. 13 plants in the family.

The immediate parent had P colour petals, petals and segments not contiguous or overlapping, bilobed, scale, blotch present, hermaphrodite flowers, filaments purple, stigmata purple.

Habit: of all plants, semi-prostrate; stems up to 3 dm. long; green with a little anthocyanin in vegetative parts.

Indumentum: glabrous.

Leaves: showing a considerable range, not scorable into classes, and no exact parental extremes, ranging from 2.5 cm. long and 0.7 cm. broad to 1.8 cm. long and 0.4 cm. broad.

Inflorescence: 1 to 4 flowers, 12 slightly drooping and slightly zygomorphic: 1 actinomorphic.

Calyx: all broadly ellipsoid; with much anthocyanin.

Corolla: colour 1 M: 11 P: 1 W; neither petals nor segments overlapping; petals in all bilobed, in all $\frac{3}{4}$ lobing; 12 small scale: 1 boss; 12 with blotch: 1 with no blotch.

Sex: 4 hermaphrodite: 2 hermaphrodite and female: 7 female.

Filaments: 5 purple: 1 white; anthers 6 purple.

Stigmata: 11 purple: 2 white; immature seeds 11 purple: 2 white.

Mature capsules: all of *S. maritima* type.

Mature seeds: 8 armadillo: 4 weak armadillo.

N. 84. N. 41 plant 9 selfed. 32 plants in the family.

The immediate parent had M colour petals, petals and segments not contiguous or overlapping, bilobed, scale, blotch present, hermaphrodite flowers, filaments purple, stigmata purple.

Habit: of all plants, semi-prostrate; stems up to 4.9 dm. long; medium anthocyanin in vegetative parts; with some green overwintering barren shoots.

Indumentum: glabrous.

Leaves: showing a considerable range, not scorable into classes, and no exact parental extremes, ranging from 3.2 cm. long and 0.7 cm. broad to 1.6 cm. long and 0.3 cm. broad.

Inflorescence: 1 to 4 flowers, all slightly drooping and slightly zygomorphic.

Calyx: all broadly ellipsoid; with much anthocyanin.

Corolla: colour 15 M: 16 P: 1 W; neither petals nor segments overlapping except in 2 where petals overlap; 23 bilobed: 9 multilobed; in all $\frac{3}{4}$ lobing; all with small scale; 29 with blotch: 3 with no blotch.

Sex: 30 hermaphrodite: 2 hermaphrodite and female.

Filaments: 31 purple: 1 white; immature seeds 30 purple: 2 white.

Mature capsules: all of *S. maritima* type.

Mature seeds: all armadillo.

N. 45. A.15 \times C.1. 40 plants in the family.

Habit: of all plants, semi-prostrate; stems up to 4.0 dm. long; 24 much anthocyanin in vegetative parts: 16 little anthocyanin in vegetative parts; all with some overwintering barren shoots.

Indumentum: glabrous.

Leaves : narrow, as in A.15.

Inflorescence : 3 to 5 flowers, slightly drooping and slightly zygomorphic.

Calyx : 21 cylindric : 19 narrowly ellipsoid ; 11 light green plants with much anthocyanin in calyx : 5 light green plants with very much anthocyanin in calyx : 8 purple green plants with much anthocyanin in calyx : 16 purple green plants with very much anthocyanin in calyx.

Corolla : colour 2 D : 27 M : 11 P ; neither petals nor segments overlapping ; petals all bilobed, in all $\frac{3}{4}$ lobing ; 38 scale : 2 small scale to boss ; blotch present in all.

Sex : all hermaphrodite.

Filaments : all purple ; anthers all purple.

Stigmata : 38 purple : 2 white ; immature seeds all purple.

Mature capsules : all of *S. maritima* type.

Mature seeds : armadillo.

N. 63. N. 45 plant 15 selfed. 24 plants in the family.

Plant 15 had little anthocyanin in vegetative parts, narrowly ellipsoid calyx with very much anthocyanin, M colour of petals, scale, stigmata purple.

Habit : of all plants, semi-prostrate ; stems up to 3 dm. long ; 5 with very much : 10 with medium : 9 with little anthocyanin in vegetative parts.

Indumentum : glabrous.

Leaves : narrow.

Inflorescence : 1 to 4 flowers ; 22 slightly zygomorphic : 2 actinomorphic.

Calyx : all narrowly ellipsoid ; with much anthocyanin.

Corolla : colour 1 D : 11 M : 3 P : 9 W ; 21 petals and segments not overlapping or contiguous : 3 petals and segments overlapping or contiguous ; petals in all bilobed and in all $\frac{3}{4}$ lobing ; all bilobed ; 5 small scale : 19 scale ; all with blotch.

Sex : 17 hermaphrodite : 2 hermaphrodite and female : 5 female.

Filaments : 12 purple : 7 white ; anthers all purple.

Stigmata : 16 purple : 8 white ; immature seeds 20 purple : 3 white.

Mature capsules : all of *S. maritima* type.

Mature seeds : all armadillo.

In two plants (Nos. 15, 16) many flowers developed imperfectly, i.e., the calyx did not open, the petals did not emerge, but the stigmata projected.

N. 64. N.43 plant 35 selfed. 1 plant in the family.

Plant 35 had very much anthocyanin in vegetative parts, cylindric calyx, D colour of petals, scale, stigmata purple.

Habit : semi-prostrate ; very much anthocyanin in vegetative parts.

Indumentum : glabrous.

Leaves : narrow.

Inflorescence : 1 to 4 flowers, slightly drooping and zygomorphic.

Calyx narrowly ellipsoid : with much anthocyanin.

Corolla : colour D ; neither petals nor segments overlapping ; petals bilobed, $\frac{3}{4}$ lobing ; small scale ; blotch present.

Sex : hermaphrodite.

Filaments : purple ; anthers purple.

Stigmata : purple ; immature seeds purple.

Mature capsules : of *S. maritima* type.

Mature seeds : armadillo.

N. 73. N. 45 plant 31 selfed. 7 plants in the family.

Plant 31 had little anthocyanin in vegetative parts, narrowly ellipsoid calyx, P colour of petals, scale, stigmata white.

Habit : semi-prostrate ; 1 medium anthocyanin in vegetative parts : 6 little ; stems up to 3.1 dm. long.

Indumentum : glabrous.

Leaves : narrow.

Inflorescence : 1 to 4 flowers, slightly drooping and zygomorphic.

Calyx : all narrowly ellipsoid ; 6 with much anthocyanin in calyx : 1 with very much.

Corolla : colour 5 P : 2 W ; 6 petals and segments overlapping : 1 petals and segments not overlapping ; petals bilobed, $\frac{3}{4}$ lobing ; 1 scale : 6 small scale ; blotch present in all.

Sex : 6 hermaphrodite : 1 hermaphrodite and female.

Filaments : 4 purple : 3 white ; anthers all purple.

Stigmata : 2 purple : 5 white ; immature seeds all purple.

Mature capsules : of *S. maritima* type.

Mature seeds : armadillo.

N. 51. C.1 \times A.21. 7 plants in the family.

Habit : of all plants semi-prostrate ; stems up to 4.5 dm. long ; all with medium anthocyanin in vegetative parts ; overwintering green barren shoots present.

Indumentum : glabrous.

Leaves : with a slight fluctuation, intermediate between the parents, but rather verging towards A. 21.

Inflorescence : 4 to 12 flowers, on the whole the stems and plants are more floriferous than in A. 2, A. 21, C. 1, N. 41, and N. 45, very slightly drooping and very slightly zygomorphic.

Calyx : in all plants broadly ellipsoid ; with very much anthocyanin.

Corolla : colour 3 M 1 : 4 P 1 ; neither petals nor segments overlapping ; petals all bilobed, in all $\frac{3}{4}$ lobing ; 3 small scale : 4 boss ; blotch present in all.

Sex : all hermaphrodite.

Filaments : all purple ; anthers all purple.

Stigmata : 4 purple : 3 white ; immature seeds all purple.

Mature capsules : all of C.1 type.

Mature seeds : 5 tubercled.

N. 77. N.51 plant 1 selfed. 15 plants in the family.

Plant 1 had P1 petal colour, bosses, white stigmata.

Habit : semi-prostrate ; stems up to 4.5 dm. long ; medium anthocyanin in vegetative parts.

Indumentum : glabrous.

Leaves : little definite segregation, ranged from 4.2 cm. long and 0.5 cm. broad to 2.0 cm. long and 0.3 cm. broad.

Inflorescence : 3 to 7 flowers ; 9 slightly zygomorphic : 6 actinomorphic.

Calyx : 10 broadly ellipsoid : 5 ellipsoid ; all with much anthocyanin.

Corolla : colour 4 P1 : 3 P2 : 8 W ; neither petals nor segments overlapping ; 3 multilobed : 12 bilobed, all $\frac{3}{4}$ lobing ; 9 small scale to boss : 6 boss ; 13 blotch present : 2 blotch absent.

Sex : 13 hermaphrodite : 2 hermaphrodite and female.

Filaments : 6 purple : 9 white ; anthers all purple.

Stigmata 7 purple : 8 white ; immature seeds 12 purple : 2 white.

Mature capsules : 11 as C.1 : 3 as A.21.

Mature seeds : 14 tubercled.

N. 85. N. 51 plant 6 selfed. 2 plants in the family.

Plant 6 had M 1 petal colour, small scale, purple stigmata.

Habit : semi-prostrate ; stems up to 4.7 dm. long ; medium anthocyanin in vegetative parts ; overwintering barren shoots present.

Indumentum : glabrous.

Leaves : no definite segregation to parental extremes, from 3.7 cm. long and 0.5 cm. broad to 2.5 cm. long and 0.4 cm. broad.

Inflorescence : 3 to 7 flowers ; 2 actinomorphic.

Calyx : 2 broadly ellipsoid ; 1 with much : 1 with medium anthocyanin.

Corolla : colour 1 D 1 : 1 W ; neither petals nor segments overlapping ; bilobed, $\frac{3}{4}$ lobing, blotch present ; small scale.

Sex : 2 hermaphrodite.

Filaments : 2 purple ; anthers 2 purple.

Stigmata : 2 purple ; immature seeds 1 purple : 1 white

Mature capsules : 2 as C.1.

Mature seeds : 1 tubercled : 1 armadillo.

STERILITY.

Some of the families described above, and especially those involving C.1 and *S. vulgaris*, are small. In all the families described in this paper, the seed produced by the controlled crossings and selfings showed high percentage germination. When the families

were small there was low seed production, not low germination of apparently good seed. A number of pollinations were made which did not result in any seed. These were :—

N. 41 plant 1 selfed.

N. 45 plant 7 selfed.

N. 45 plant 9 selfed.

N. 50 plant 1 selfed.

DISCUSSION.

The crosses involving C.1 and *S. vulgaris* showed a high degree of sterility and only one plant was raised from each of two reciprocal crosses. These two plants were approximately intermediate between the parents for habit, indumentum, leaf-shape, number of flowers, slightly zygomorphic flowers, calyx-shape and capsule shape. They showed characters common to both parents in no over-wintering barren shoots, bilobed $\frac{3}{4}$ lobed petals, petals and segments not overlapping or contiguous, and white immature seeds. N. 50 in having purple anthers and filaments, also agreed with both parents. N. 48 agreed with neither parent in being female. They agreed with C.1 in having a coloured corolla, and agreed with or tended towards C.1 in the amount of anthocyanin in the calyx. They showed (as between the two single-plant families) segregation for small scale and boss and for tubercled and armadillo seeds.

The crosses involving C.1 and *S. maritima* were much larger and the characters in the F_1 and F_2 families may be considered in sequence :

Habit. All the plants (98 in F_1 families, 94 in F_2 families) were semi-prostrate in habit. Slight differences in habit were not scorable into classes. All the parents had prostrate or semi-prostrate stems and no aberrant type appeared in the offspring from any cross. In all plants tested for over-wintering habit (2 year old plants) some green barren shoots persisted, at least till mid-winter. This is a *S. maritima* character.

Indumentum. All plants in both F_1 and F_2 families were glabrous, as were all the parents.

Leaf-shape. The F_1 families were approximately intermediate for this character between C.1 and the (different) *S. maritima* parents, except that in the families derived from A.15 \times C.1, in which there was little constant difference between the leaf-shapes of the two parents, the F_1 , on the whole, was more like the ovule parent (A.15). In the F_2 families from N. 41 there was a considerable range in leaf-shape but this was not scorable into definite classes and no parental extremes appeared in 45 plants. In the F_2 families from N. 51 there was little definite segregation and none to clearly marked parental extremes in 17 plants.

Inflorescence. On the whole the low flower number of C 1 (1-3 flowers) was slightly raised (1-3-5-7) by the introduction of *S. maritima*, most markedly in N. 51, an F_1 family with C.1 as the

ovule parent. F_1 families showed all flowers slightly nodding and slightly zygomorphic. The F_2 families gave the following figures:—

				More or less zygomorphic.		Actinomorphic.
N. 66	...	...	...	12	...	1
N. 84	...	...	...	32	...	0
N. 63	...	...	...	22	...	2
N. 64	...	...	...	1	...	0
N. 73	...	...	...	7	...	0
N. 77	...	...	...	9	...	6
N. 85	...	...	...	0	...	2
Totals				83		11

Nodding and zygomorphy, on the one hand, and erectness and actinomorphy, on the other hand, are constantly associated in the *Silene* species which we are investigating genetically. In its nodding zygomorphic flowers C.1 shows a *S. vulgaris* character. In crossing typical *S. maritima* and typical *S. vulgaris*, F_1 families are approximately intermediate and the clear-cut segregation of erect actinomorphic flowers in F_2 families is rare. It is interesting, therefore, to obtain 11 actinomorphic out of a total of 94 plants in the above listed families. It should, however, be noted that 8 of these occurred in two small families when C.1 (as ovule parent) was crossed with a non-typical *S. maritima*.

Calyx. In all plants there was medium to very much anthocyanin. In calyx-shape, N. 41, and the F_2 families derived from it, and N. 51, and the F_2 families derived from it, were broadly ellipsoid, except that 5 plants in N. 77 had ellipsoid calyces (possibly fluctuations). N. 45 segregated into 21 cylindric: 19 narrowly ellipsoid, but the F_2 families were all narrowly ellipsoid. The influence of the narrow-cylindric parent, A.15 was obvious.

Corolla colour. Comparative studies forced us to recognize 8 groups forming two series from dark colour (D and D1) to white (W). The figures obtained may be set out as follows:—

			D	M	P	W	
N. 41 (F_1)	...	...	0	45	6	0
N. 66 (F_2 from P)	...	...	0	1	11	1
N. 84 (F_2 from M)	...	...	0	15	16	1
N. 45 (F_1)	...	...	2	27	11	0
N. 63 (F_2 from M)	...	...	1	11	3	9
N. 64 (F_2 from D)	...	...	1	0	0	0
N. 73 (F_2 from P)	...	...	0	0	5	2
			D1	M1	P1	P2	W
N. 51 (F_1)	0	3	4	0	0
N. 77 (F_2 from P1)	0	0	4	3	8
N. 85 (F_2 from M1)	1	0	0	0	1

For petal colour the genic background introduced by A.2 and A.15 was essentially similar, but A.21 introduced a modification which

appeared in all the offspring with coloured flowers. It is tentatively suggested that two gene pairs are sufficient to give the colour intensities found in the two groups of families from C.1 with either A.2 or A.15, and that a modifier of these, from A.21, results in the relatively slightly different colour series in the last group of families.

Overlapping of petals and segments. Except in the small family of 7 plants in N. 73, the large majority of plants in both F_1 and F_2 families showed petals and segments not overlapping. Not overlapping is clearly dominant to overlapping. There was no overlapping in either of the original parents or in any of the F_1 or F_2 plants in the N. 51 group of families. A.15 was a rather uncertain plant for this character and was scored as "petals overlapping and the segments divergent"—i.e., it was not an extreme broad petalled plant (see Plate VII, K.B. 1929, facing p. 151). Probably this condition of the *S. maritima* parent accounts for the segregation in the F_2 families N. 63 and N. 73.

Petal lobing. Lobing was $\frac{3}{4}$ in all the F_1 and F_2 plants, even in those involving A.21, in which lobing was $\frac{2}{3}$. A few multilobed plants (i.e., plants with some petals multilobed in some, often a very few, flowers) appeared in N. 41, N. 48, and N. 77.

Coronal development. C.1 had small scales, A.2 and A.15 had well developed scales, and A.21 showed fluctuation from small scale to boss. Segregation occurred in the different families, but it is evident that some plants scored as having scales in N. 41 and N. 45 were heterozygous for this character. It is significant that no full scales appeared in the N. 51, N. 77, and N. 85 families.

Petal blotch. It is difficult to score this character in coloured flowers. The majority of the plants (all in the N. 45 series of families) had blotches, but some, even in coloured petals had no definite blotches in N. 41, N. 66, N. 84, and N. 77.

Sex. In C.1, A.15, and A.21 only hermaphrodite flowers were observed; A.2 had mainly female, with a few hermaphrodite, flowers. The larger number of female and hermaphrodite-female plants in N. 41, and the F_2 families from it, is in accord with expectations.

Anthocyanin development in androecium and gynoecium.

	Filaments		Anthers		Stigmata		Immature seeds	
	P	W.	P.	W.	P.	W.	P.	W.
N. 41 ...	31	6	37	0	49	2	51	0
N. 66 ...	5	1	6	0	11	2	11	2
N. 84 ...	31	1	32	0	31	1	30	2
N. 45 ...	40	0	40	0	38	2	40	0
N. 63 ...	12	7	19	0	16	8	20	3
N. 64 ...	1	0	1	0	1	0	1	0
N. 73 ...	4	3	7	0	2	5	7	0
N. 51 ...	7	0	7	0	4	3	7	0
N. 77 ...	6	9	15	0	7	8	12	2
N. 85 ...	2	0	2	0	2	0	1	1

Purple anthers alone occur all through the families. Where segregation occurs for colour of filaments, stigmata, or immature seeds, the larger number of plants is for the presence of colour in the respective organ, except: in N. 73 for stigmata (from an immediate parent with white stigmata); in N. 77 for filaments, and stigmata (from an immediate parent with purple filaments and white stigmata); and in N. 85, for immature seeds, where the numbers are too low to have much more significance than showing that segregation occurs.

Anthocyanin inheritance in flower parts has been discussed in several previous papers in this series (notably in K.B. 1932, 234 seq. and K.B. 1934, 386 seq.). It is intended to summarize the results in a later part.

Capsule type. C.1 (like certain other Central European high mountain plants of this group) had capsules of the *S. maritima* type—an important fact in considering the phylogeny of *S. vulgaris* and *S. maritima*. A.2 and A.15 were typical *S. maritima* in capsule characters. F_1 and F_2 families involving C.1, A.2, and A.15 had all *S. maritima* capsules. A. 21 had capsules of “an exaggerated *maritima* type” (K.B. 1937, 46). The ordinary *S. maritima* type was dominant in F_1 over the “exaggerated” type, but 3 of the latter segregated from 14 plants in N. 77.

Mature seeds. In N. 41 and N. 45 and the F_2 families derived from them only plants with armadillo seeds appeared. This was expected as C.1, A.2, and A.15 had armadillo seeds, a character previously known to be recessive to tubercled. The only aberrant result was the occurrence of 4 modified armadillo plants (termed “weak armadillo”) in N.66.

A. 21 was strongly tubercled and only plants with tubercled seeds appeared in F_1 and in N. 77. A segregation for armadillo appeared in N. 85. These results can be satisfactorily interpreted on the basis of “tubercled” (including “strongly tubercled”) being dominant over armadillo.

SUMMARY.

The results are given of crossing a plant from the Eastern Alps with British stocks of *S. vulgaris* and *S. maritima*, including a mountain plant of the latter from Wales. Considerable sterility was shown by some of the crosses and selfings—especially when *S. vulgaris* was used as the second parent. C.1 is a representative of high mountain Central European plants, which, while classifiable under *S. vulgaris* s. l. for such characters as zygomorphic, nodding flowers, and the frequent occurrence, though not in C.1, of indumentum, recall *S. maritima* in having few flowered inflorescences and squat capsules with reflexing teeth. Other characters often parallel with those of *S. maritima* are the leaf-shape and the high percentage occurrence in the wild of armadillo seeds. Since other high mountain plants are in process of being analyzed genetically,

a consideration of the taxonomic importance of the results is reserved till the experiments are completed. On the whole the introduction of C.1 did not result in greater complexity of segregation than when British material alone has been used. Even coloured petals appear in some wild populations of British *S. vulgaris* (e.g., Loch Tay shore and Plymouth Hoe). Most of the characters behaved genetically according to expectations derived from previous investigations.

The research on which this paper is based has been aided by a Royal Society Government Grant.

LVIII—NOTES ON MESEMBRYANTHEMEAE: I.

THE GENUS *BROWNANTHUS* SCHWANTES. A. A. Bullock.

The generic name *Brownanthus* was coined by Schwantes (5) for N. E. Brown's genus of *Mesembryanthemeae* which the latter had named *Trichocyclus* (1). This name, although aptly descriptive of the ring of deflexed hairs around the base of each pair of leaves, cannot be used for the genus on account of the existence of the name *Trichocyclus* Dulac (3). In his *Flore des Hautes-Pyrénées*, Dulac made new names for all genera which had been named after persons, a procedure to which he objected, and the well known name of the genus of ferns, *Woodsia* R. Br., was illegitimately changed by him to *Trichocyclus*. Thus, although *Trichocyclus* Dulac was an illegitimate name, it was validly published by reference to *Woodsia* R. Br., and it is this fact which, in accordance with the International Rules, Art. 61, renders necessary the rejection of the name *Trichocyclus* N. E. Br. as a later homonym.

It must be admitted that, on account of some ambiguity in the wording of the rules then in force, Brown was in some measure justified in his argument for maintaining *Trichocyclus* N. E. Br. (2), but the latest edition of the rules, approved by the Botanical Congress of 1935, leaves no doubt that only validity of publication is to be considered in cases of this nature.

As far as I have been able to ascertain, Schwantes has never replied to Brown's article rejecting *Brownanthus*, and this name has never received recognition.

The articles by Maass (4), which include a key to the five species recognised by Brown, should have appeared under Brown's name alone, as they are, in effect, translations of notes supplied by Brown, and now deposited in the Kew Herbarium.

A new key to the five species is given below, and an enumeration including all the synonymy and references to the literature that I have been able to collect. The notes following the citations of herbarium specimens are taken partly from the late Dr. Brown's manuscript, and partly from a consideration of the literature and specimens. I have deferred giving detailed descriptions of the species until living material of at least some of them becomes available.

Brownanthus *Schwantes* in Zeitschr. Sukkulantenk. 3, 14 (in clavi) et 20 (1927).

Trichocyclus N.E. Br. in Bothalia, 1, 151 (1923), et in Gard. Chron. Ser. 3, 78, 433 (1925), in clavi, et in Phillips, Gen. S. Afr. Fl. Pl. 248 (1926), et in Journ. Bot. 66, 267 (1928) in obs.; Maass in Zeitschr. Sukkulantenk. 3, 233 et 322 (1928); von Poelln. in Fedde, Repert. 32, 70 (1933); Jacobsen, Die Sukkulanten, 181, f. 188 (1933), et Succ. Pl. 251, f. 239 (1935)*; Pax et Hoffm. in Engl. et Prantl, Natürl. Pflanzenfam. 2 Aufl. 16 C, 220 (1934); non Dulac, Fl. Hautes-Pyrén. 31 (1867).

CLAVIS SPECIERUM

Folia elongata, subcylindrica vel leviter applanata; annulus pilorum deflexorum semper conspicuus; internodia ramorum haud clavata:

Papillae foliorum in setam mollem non desinentes:

Rami erecti multiramosi.....1. *B. ciliatus*

Rami erecti simplices.....2. *B. simplex*

Papillae foliorum omnes in setam mollem desinentes 3. *B. pubescens*

Folia deltoidea; rami erecti ramosi, internodiis crasse clavatis:

Annulus pilorum deflexorum conspicuus.....4. *B. Marlothii*

Annulus pilorum deflexorum inconspicuus, sed vaginae foliorum infra basin in cupulam scariosam inversam productae

5. *B. namibensis*

1. **Brownanthus ciliatus** (Ait.) *Schwantes* in Zeitschr. Sukkulantenk. 3, 21 (1927).

Mesembryanthemum ciliatum Ait. Hort. Kew. ed. I. 2, 179 (1789); Thunb. in Nov. Act. Car. Leop. Ephem. 8, App. 11 (1791), et Fl. Cap. ed. Schultes, 416 (1823); Haw. Obs. Mesembr. 363 (1794); Sond. in Harv. et Sond. Fl. Cap. 2, 436 (1861-62); L. Bolus in Ann. S. Afr. Mus. 9, 147 (1913).

Mesembryanthemum Schenckii Schinz in Bull. Herb. Boiss. 5, App. 3, 80 (1897); Dinter, Neue und wenig bekannte Pflanzen Deutsch-Südwest-Afrikas, 43, f. 57 (1914), et in Fedde, Repert. 19, 192 (1923).

Trichocyclus ciliatus (Ait.) N.E. Br. in Bothalia, 1, 151 (1923), et in Phillips, Gen. S. Afr. Fl. Pl. 248 (1926), et in Journ. Bot. 66, 267 (1928), et in Brown, Tisch. et Karst. ed. Labarre, Mesembryanthema, 296, f. 166 (1931); Maass in Zeitschr. Sukkulantenk. 3, 234, cum fig. (1928), et l.c. 322, in clavi; Jacobsen, Die Sukkulanten, 182, f. 188 (1933), et Succ. Pl. 251, f. 239 (1935).

Brownanthus Schenckii (Schinz) *Schwantes* in Zeitschr. Sukkulantenk. 3, 21 (1927).

SOUTH-WEST AFRICA. Aus, *Dinter* 1150; *ibid.*, *Schenck* 174 (type collection of *M. Schenckii*); *ibid.*, "common", *Pearson* 8057; Garub, 900 m., *Dinter* 1048.

* This is the improved English edition, translated by Mrs. V. Higgins.

SOUTH AFRICA. Kenhart Div.: Pofadder, *Vanzyl* (ex herb. N.E. Br.). Calvinia Div.: on red sand about 8 miles S.-W. of Bitterfontein, *Pearson* 3941*. Van Rhynsdorp Div.: karoo between Oliphants R. and the Bokkeveld, *Thunberg* (type, not seen). Ceres Div.: karoo between Gansfontein and Pappekuul, 300 m., *Pearson* 3687—"spreading bush with prostrate branches, flowers white." Laingsburg Div.: Rietvlei, *Muir* 4215. Prince Albert Div.: karoo, without precise locality, *van der Bijl* 64—"plants lie flat on the ground, covered with flowers." Uniondale Div.: karoo, 13 miles from Uniondale, on the road to Willowmore, 720 m., growing in shale, *Fourcade* 4284.

This is the type-species of the generic name, and, as indicated above, it occurs over an immense area, from southern South-West Africa in the north to the Uniondale Division of South Africa in the south. Some of the specimens from South-West Africa approach *T. simplex* in being less branched than specimens from areas nearer to the *locus classicus*, but the branching probably varies according to environmental conditions. Dr. J. Muir (in litt. 28. xii. 1927) sent cuttings grown by him to Dr. Brown, showing internodes on a young growth four times as long as those on the old stems.

As far as can be ascertained, *B. ciliatus* is the only species of the genus in cultivation in Europe, and the illustration cited above is from a photograph of a plant in the collection of M. de Laet. According to Aiton, it was introduced by Masson in 1774.

2. **Brownanthus simplex** (*N. E. Br. ex Maass*) *Bullock*, comb. nov.

Trichocyclis simplex N.E. Br. ex Maass in *Zeitschr. Sukkulantenk.* 2, 234 (1928), nomen, et l.c. 322, in clavi; N.E. Br. in Brown, *Tisch. et Karst. ed. Labarre, Mesembryanthema*, 297 (1931), in obs., Jacobsen, *Die Sukkulanten*, 182 (1933), et *Succ. Pl.* 252 (1935).

SOUTH-WEST AFRICA. Lüderitz District: stony ground between Klein Karas and Nakies, *Pearson* 8067 (type)—"bush 1 ft. high, flowers white."

This specimen consists of a single (presumably) horizontal branch, bearing several erect flowering shoots up to about 4 inches long, unbranched, and bearing one or two terminal, almost sessile, flowers. The leaf-sheaths are half to three-quarters of the length of the internodes, and the ends of the deflexed hairs are covered by the sheath next below them, the remaining parts forming a silky covering of the exposed part of the stem.

This may be only a form of *B. ciliatus*, but the single specimen presents a somewhat different facies, and until more material becomes available, it is impossible to reach a decision.

* A manuscript note by the late Dr. N. E. Brown says, "Matches the type of *M. ciliatum* Thbg., in Thunberg's Herb.! Comp. Jan. 24, 1922."

3. **Brownanthus pubescens** (N. E. Br. ex Maass) Bullock, comb. nov.

Trichocyclus pubescens N.E. Br. ex Maass in Zeitschr. Sukkulantenk. 3, 234 (1928) nomen, et l.c. 322, in clavi.

Trichocyclus buchubergensis Dinter, Pl. Exsicc. No. 6485, et in Fedde, Repert. 29, 169 (1931), nomen, in obs.

Trichocyclus Pillansii L. Bolus, Notes Mesembr. 2, 311 (1932).

SOUTH-WEST AFRICA. Lüderitz District: flats east of the Bukhu Mts., Dinter 6485 (type collection of *T. buchubergensis*).

SOUTH AFRICA. Little Namaqualand: Richtersveld, abundant on old river terraces on south side of Orange R., between Arris Drift and Swartwater, Pillans 5706*; between Arris Drift and Arris, Pillans 5042*; Sendling's Drift, Herre (Stellenbosch University Garden 8758*); between Verleptpraam (Roode Kop?) and the mouth of the Orange R., Drège 2937 (type).

The type specimen consists of a single young stem, and the pubescence is due to the fact that each of the leaf-papillae is produced into a long soft hair. In the dried state, the papillae themselves collapse, and are not easy to see.

As in *B. namibensis*, the annulus of deflexed hairs in this species is not so prominent as in *B. ciliatus*, but the leaf-sheaths are produced below the leaf base into a shallow scarious inverted cupule encircling the stem. In this species, and in *B. Marlothii*, the leaf-bases are swollen, and the plants present a jointed or "salicornioid" appearance.

Dr. Bolus states that *T. Pillansii* flowered in Mr. Pillans' garden in February, 1927 and at Stellenbosch in December, 1931. Presumably her description was drawn up partly from living plants and partly from dried material, and it is therefore difficult to fix a type for the name *T. Pillansii*.

4. **Brownanthus Marlothii** (Pax) Schwantes in Zeitschr. Sukkulantenk. 3, 21 (1927).

Mesembryanthemum Marlothii Pax in Engl. Bot. Jahrb. 10, 13 (1889); Schinz in Bull. Herb. Boiss. 5, App. 3, 80 (1897); Marl. in Trans. Roy. Soc. S. Afr. 2, 34 (1910); Dinter in Fedde, Repert. 19, 190 (1923), et l.c. 29, 163 (1931).

Trichocyclus Marlothii (Pax) N.E. Br. in Journ. Bot. 66, 267 (1928), et in Brown, Tisch. et Karst. ed. Labarre, Mesembryanthema, 297 (1931), in obs.; Maass in Zeitschr. Sukkulantenk. 3, 234 (1928), et l.c. 322, in clavi; Jacobsen, Die Sukkulanten, 182 (1933), et Succ. Pl. 252 (1935).

* These specimens are cited by Dr. Bolus under her *Trichocyclus Pillansii*. I have not seen any of them, but the description leaves no doubt that they belong here.

Mesembryanthemum solutifolium Berger in Engl. Bot. Jahrb. 57, 631 (1922).

SOUTH-WEST AFRICA. Lüderitz District: in stony places near Angra Pequena, *Marloth* 1149 (fragment of the type collection in Kew Herb.); *ibid.*, *Schinz* 922; *ibid.*, *Moss* 11562; Lüderitz Bay (= Angra Pequena), *Dinter* 1008 (type collection of *Mesembryanthemum solutifolium*); *ibid.*, received by N. E. Brown from Mrs. E. Sexton, collector unknown; Pomona, *Dinter* 6419; Kohlmann's Koppe, 150 m., frequent in stony places, *Engler* 6802—"large cushions up to 1 m. diam. and 10-15 cm. high."

SOUTH AFRICA. Little Namaqualand: high river terrace near mouth of Orange River, *Pillans* 5146.

The jointed or "salicornioid" appearance of the stems in *B. Marlothii* has been referred to under the preceding species. This is, however, much more pronounced in *B. Marlothii*. The swollen leaf-base forms a shallow cup, the small deltoid lamina being eventually detached by an abscission on its rim. The annulus of deflexed hairs is at first prominent, but later becomes reduced to a white line around the base of the leaf-sheath.

5. *Brownanthus namibensis* (Marl.) Bullock, comb. nov.

Trichocyclus namibensis (Marl.) N.E. Br. ex Maass in Zeitschr. Sukkulantenk. 3, 234 (1928), nomen, et l.c. 322, in clavi; Jacobsen, Succ. Pl. 252 (1935).

Mesembryanthemum namibense Marl. in Trans. Roy. Soc. S. Afr. 2, 35 (1910); *Dinter* in Fedde, Repert. 29, 163 (1931).

SOUTH-WEST AFRICA. Lüderitz District: in stony places near Lüderitz Bay, *Marloth* 4610 (type collection); *ibid.*, *Moss* 11656; *ibid.*, *Dinter* 6002.

This is in some respects intermediate between *B. Marlothii* and *B. ciliatus*. The leaves, while still deltoid in shape are longer than in *B. Marlothii*, and on withering or drying they become weakly spinescent before falling. The annulus of deflexed hairs is here very short, but the leaf sheath is conspicuously prolonged downwards into an inverted scarious cup. This effect would be produced in other species if the hairs became united.

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LIX—NOTES ON THE GENUS CENTAURIUM.

1. THE NOMENCLATURE OF THE BRITISH SPECIES. J. S. L. GILMOUR. THE GENERIC NAME.

Linnaeus (Sp. Pl. 229 : 1753) united the centauries with the gentians and other genera under the name *Gentiana*. The first subsequent author to separate them was Hill (Brit. Herb. 62 : 1756), who revived the name *Centaurium* which had been used by Dodoens, Caspar Bauhin and others. Hill, however, included both *Chlora* and *Cicendia* under the name *Centaurium*. This concept was amended by Adanson (Fam. Pl. 2, 507 : 1763), who confined the name to the centauries. Unless, therefore, Hill's and Adanson's works are rejected by international agreement, the valid name for the genus is *Centaurium* Hill, emend. Adanson (see Druce in Naturalist, 1926, 115).

LIST OF BRITISH SPECIES AND HYBRIDS, WITH IMPORTANT SYNONYMS AND NOTES.

In the following list, where varieties are enumerated, these are not intended as fully representative of the intraspecific variation in Britain of the species concerned; they are included since the specific names adopted necessitate in some cases new varietal combinations, and it is convenient to have these collected in one place. In each case a varietal name has been given to that portion of the species usually regarded as "typical," as this seems more logical than to leave one portion designated by the specific name only.

1. *Centaurium umbellatum* Gilib. Fl. Lith. 1, 35 (1785).—*Gentiana Centaurium* L. Sp. Pl. 229 (1753), excl. vars. β & γ . *Chironia Centaurium* Curt. Fl. Lond. fasc 4, t. 22 (1798). *Centaurium vulgare* Rafn, Danm. Fl. 2, 73 (1800). *C. Erythraea* Rafn, op. cit. 75. *Erythraea Centaurium* Pers. Syn. 283 (1805).

Varities.

a. Var. *Centaurium* (L.) Gilmour, stat. nov.—*Gentiana Centaurium* L. l.c., excl. vars β & γ .

b. Var. *fasciculare* (Duby) Gilmour, comb. nov.—*Chironia Centaurium* var. *fascicularis* Duby in De Candolle, Bot. Gall. 1, 328 (1828). *Erythraea Centaurium* var. *conferta* Wheld. et Salm. in Journ. Bot. 1925, 345.

c. Var. *subcapitatum* (Corb.) Gilmour, comb. nov.—*Erythraea Centaurium* var. *subcapitata* Corb. Nouv. Fl. Norm. 392 (1893).

E. Centaurium var. *capitata* Koch sec Wheld. et Salm. in Journ. Bot. 1925, 345, et auct., non Koch, Syn. 492 (1837).

d. Var. **sublitorale** (Wheld. et Salm.) Druce, in Naturalist, 1926, 115.—*Erythraea Centaurium* Pers. var. *sublitoralis* Wheld et Salm. l.c.

Hybrids.

X *C. Wheldonianum* Druce, Brit. Pl. List, 78 (1928).

(*C. pulchellum* x *umbellatum*).

X *C. intermedium* Druce, Brit. Pl. List, 78 (1928).

(*C. littorale* x *umbellatum*).

The forms of this variable species are very numerous and run into one another. Four main groups can perhaps be distinguished and the earliest varietal names for these appear to be as given above. The treatment of var. *capitata* Koch is explained in the notes under the next species.

2. *C. capitatum* (Willd. ex Cham.) Britten et Rendle, List Brit. Seed Pl. 20 (1907).—*Erythraea capitata* Willd. ex Cham. Adnot. ad Fl. Berol. 9 (1815). *E. Centaurium* β *capitata* Koch, Syn. 492 (1837).

The history of this interesting species is fully discussed by Townsend in Journ. Linn. Soc. 18, 402 (1881). One further point may be mentioned. *Erythraea Centaurium* β *capitata* Koch, l.c., has always been treated as distinct from Willdenow's *E. capitata*, and has been regarded as a dwarf variety of *C. umbellatum* (see, for example, Wheld. & Salm. in Journ. Bot. 1925, 345). In Koch's original description, however, he cites Willdenow's plant as a synonym and it is clear that he was merely reducing the status of the latter's species to that of a variety.

3. *C. littorale* (Turner) Gilmour, comb. nov.—*Chironia littoralis* Turner, in Turner et Dillwyn, Bot. Guide, 469 (1805); Smith, Eng. Bot. 33, t.2305 (1812). *Ch. uliginosa* Wald. et Kit. Pl. Rar. Hung. 3, 287, t.259 (1809 or 1810)*. *Erythraea compressa* Hayne ex Kunth, Fl. Berol. 65 (1813). *E. littoralis* Fries, Novit. Fl. Suec. 29

* I am indebted to Mr. W. T. Stearn for the following bibliographical note :—

Although the title-page of volume 3 of Waldstein and Kitaibel's "Descriptiones et Icones Plantarum rariorum Hungariae" (folio: Vienna) is dated 1812, contemporary references show that its publication in parts spread over several years. Each part contained 10 plates and 2 or 3 sheets of text. Parts 21–22 (i.e., Vol. 3, parts 1–2), containing plates 201–220, were issued in 1807: cf. Bot. Zeit. (Regensburg) 6, 325 (14 Nov. 1807), Hinrichs', Verz. neu. Büch. Jan.–June 1807, p. 108. Parts 25–26, which can safely be assumed to have contained plates 241–260, were first offered for sale by the Leipzig bookseller, J. C. Hinrichs, in his half-yearly catalogue of new publications available during January to June 1810 (Verz. Jan.–June 1810, p. 144), but this does not exclude the possibility that they had been published at Vienna late in 1809 and reached Leipzig too late for inclusion in Hinrichs' Verz. July–Dec. 1809. The date of publication of *Chironia uliginosa* Waldst. et Kit. (op. cit. 3, t. 259) would accordingly appear to be late in 1809 or early in 1810.

(1814). *E. linariifolia* Pers. sec. Koch, Syn. 492 (1837) et auctt., non Pers. Syn. 1, 293 (1805). *E. Turneri* Wheld. et Salm. in Journ. Bot. 1925, 347.

Varieties.

a. Var. **littorale** (Turner) Gilmour, comb. nov.—*Chironia littoralis* Turner, l.c. *Erythraea vulgaris* var. *littoralis* Wittr. Bot. Not. 1884, 115. *E. Turneri* Wheld. et Salm. l.c.

b. Var. **occidentale** (Wheld. et Salm.) Gilmour, comb. nov.—*E. compressa* Hayne var. *occidentalis* Wheld. et Salm. in Journ. Bot. 1925, 349.

c. Var. **Bayleyi** (Wheld. et Salm.) Gilmour, comb. nov.—*Erythraea compressa* Hayne var. *Bayleyi* Wheld. et Salm. Journ. Bot. 1925, 350.

d. Var. **minor** (Hartm.) Gilmour, comb. nov.—*E. compressa* Hayne var. *Friesii* forma *minor* Wheld. et Salm. in Journ. Bot. 1925, 349.

The nomenclature of the narrow-leaved N. European centauries has been much confused, due partly to taxonomic difficulties and partly to misidentifications.

With regard to the former, the point at issue is whether the small form first described from Northumberland and Elgin by Turner (l.c.) as *Chironia littoralis*, is specifically distinct from the larger and more widely distributed form first described by Hayne (l.c.) as *Erythraea compressa*. The majority of authors have regarded these forms as conspecific, but Wheldon and Salmon (l.c.) described Turner's form as a separate species under the name *Erythraea Turneri*. A study of the variation in these narrow-leaved forms, many of which I have grown from seed in cultivation (see also Melderis, in Act. Hort. Bot. Univ. Latv. 6, 123: 1932) shows clearly that there exists a large number of genetically distinct forms as worthy of specific rank as *E. Turneri*, and it seems wisest to treat them all as one variable species. It is on this taxonomic judgment that the following nomenclatural notes are based.

In the Linnean Herbarium both *C. umbellatum* and *C. littorale* are included under the name *Gentiana Centaurium*, so it is evident that Linnaeus did not consider them distinct. Apparently the first botanists to separate them were Winch and Brodie, at the beginning of the last century. They considered that the small form from N. Britain referred to above should be regarded as a species distinct from the common centaury (*C. umbellatum*). They communicated their views to Dawson Turner who, somewhat reluctantly, described it under the specific name *Chironia littoralis* (Turner & Dillwyn, l.c.: 1805). This name was taken up in "English Botany" (l.c.) by Smith in 1812 and also, two years later, by Fries (l.c.).

Meanwhile Waldstein and Kitaibel (l.c.) in 1809 or 1810, and Hayne (l.c.) in 1813, independently described narrow-leaved centauries under the names *Chironia uliginosa* (from Hungary) and

Erythraea compressa (from near Berlin) respectively. Further, in addition to these names, three others must be taken into consideration, namely *Centaureum vulgare* Rafn (Danm. Fl. 2, 73 : 1800), *C. Erythraea* Rafn (op. cit. 75), and *Erythraea linariifolia* Pers. (l.c. 1805). These five names may be discussed in turn.

(1) *Chironia uliginosa* Wald. et Kit. This interesting E. European inland form is now regarded as only varietally distinct from the coastal forms. It is mentioned here because, if Turner's *Chironia littoralis* be accepted as a distinct species, then *uliginosa* is the earliest epithet for the remainder of the group, as it antedates *compressa* by three or four years.

(2) *Erythraea compressa* Hayne. This name has been used by several authors, either because they regarded Turner's plant as a distinct species (e.g. Wheldon and Salmon, l.c., and Butcher and Strudwick, Further Illust. Brit. Pl. 236 : 1930), or because they appear to have ignored the earlier names (e.g., Rouy & Foucaud, Fl. France, 20, 240 : 1908).

If Turner's plant be accepted as only varietally distinct then *E. compressa* becomes a synonym.

(3) *Centaureum vulgare* Rafn. This name was first applied to the narrow-leaved centauries by Wittrock (in Bot. Centralbl. 19, 59 : 1884). A study of the original Danish description (for a translation of which I am indebted to Mr. H. Gilbert-Carter) shows beyond doubt that Rafn had *C. umbellatum* in mind when he drew it up. In not a single particular does the description resemble *C. littorale*, and the figure cited from the "Flora Danica" is a good representation of *C. umbellatum*. It is a mystery how Wittrock could have made this error, which many subsequent botanists have copied.

(4) *Centaureum Erythraea* Rafn. It is even more puzzling why this name has been applied to *C. littorale* (e.g., by Raunkiaer, Dansk Ekok. Fl. 260 : 1914). Rafn's original description (Danm. Fl. 2, 75 : 1800) is of a tall, broad-leaved form of *C. umbellatum*. He compares it with a plant from Tangier and concludes that they are identical. It clearly has no connexion with *C. littorale*.

(5) *Erythraea linariifolia* Pers. This name has been frequently used for *C. littorale*, but, as was shown by Rouy & Foucaud (Fl. France, 10, 240 : 1908), the plant described by Persoon is a distinct species from Spain.

The earliest name under *Centaureum*, therefore, for the northern, narrow-leaved centauries is *C. littorale*. This combination does not appear to have been made, and it is accordingly published here, together with certain new varietal combinations.

4. *C. pulchellum* (Swartz) Druce, Fl. Berks. 342 (1897)—*Gentiana Centaureum* var. β et γ Linn. Sp. Pl. 230 (1753). *G. pulchella* Swartz in Vet. Acad. Handl. Stockh. 1783 : 84. *Erythraea ramosissima* Pers. Syn. 1, 283 (1805).

Varieties.

a. Var. **palustre** (Gaud.) Druce, in Rep. B.E.C. 1922, 615 (1923).—*Gentiana pulchella* Swartz, l.c. *Erythraea pulchella* var. *palustris* Gaud. Fl. Helv. 2, 137 (1828). *Erythraea pulchella* subsp. *simpli-
cissima* Schmitt in Linnaea, 7, 482 (1832). *E. ramosissima* β *pulchella* Griseb. ex DC. Prod. 9, 57 (1845). *E. pulchella* forma *Swartziana* Wittr. in Bot. Not. 1899, 272.

b. Var. **ramosissimum** (Gaud.) Gilmour, comb. nov.—*Gentiana palustris* Lamk. Tabl. Encycl. 1, 486 (1791). *Erythraea ramosissima* Pers. l.c. *E. pulchella* var. *ramosissima* Gaud. Fl. Helv. 2, 137 (1828). *E. ramosissima* var. *genuina* Rouy et Foucaud, Fl. Fr. 10, 243 (1908).

c. Var. **intermedium** (Mérat) Gilmour, comb. nov.—*Chironia intermedia* Mérat, Fl. Env. de Paris, ed. 2, pt. 2, p. 145 (1821). *Erythraea ramosissima* var. *intermedia* Rouy et Foucaud, l.c. [Druce, Brit. Pl. List, 79 (1928), uses the name var. *subelongatum* Wittr., but in his original description Wittrock (Bot. Not. 1899, 273) uses the word only in a phrase describing a form.]

The variability of this species is partly due to extreme plasticity under different environmental conditions, and partly to the presence of genetically distinct strains. Its various forms can be classed roughly into three groups for which the correct varietal names appear to be those given above. The earliest epithet for the whole group is *pulchellum*, which was given by Swartz to the dwarf, single-stemmed, single-flowered form, figured, for example, by Butcher and Strudwick as var. *Swartziana* (Further Illustr. Brit. Pl. t.248, z). This form, the earliest varietal epithet for which is *palustre*, represents, therefore, the "nomenclatural type."

5. **C. tenuiflorum** (Hoffmgg. et Link) Fritsch in Mitteil. Naturwiss. Ver. Wien, 5, 97 (1907).—*Erythraea tenuiflora* Hoffmgg. et Link, Fl. Portug. 1, 354, t.67 (1809).

6. **C. latifolium** (Smith) Druce in Ann. Scott. Nat. Hist. 1905, 48.—*Erythraea latifolia* Smith, Engl. Fl. 1, 321 (1824).

7. **C. scilloides** (Linn. fil. Suppl. 175 : 1781) Druce in Rep. B.E.C. 1916, 614 (1917), var. **portense** (Brot.) Druce, Rep. B.E.C. 1918, 290 (1919).—*Gentiana portensis* Brot. Fl. Lusit. 1, 278 (1804).

The history and nomenclature of this species is fully discussed by Druce, l.c., and by Stapf, Bot. Mag. t.9137. Both these authors regard the European and Azorean forms as conspecific, Druce describing them as varietally distinct, and Stapf as "geographical races." Tutin and Warburg (Journ. Bot. 1932, 12) however, treat them as distinct species, stating that the Azorean form differs from the European in the narrower obovate-elliptic (not orbicular) leaves of the barren shoots, and the white (not red) flowers with narrower petals. It would appear, however, that the difference in flower colour is not constant (see Stapf, l.c.) and an examination of

the Kew Sheets shows that the other differences are very slight. It seems best, therefore, to regard the two forms as only varietally distinct.

LX—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXXIII.* PLANTAE HINTONIANAE: V.†

GERANIACEAE NOVAE A R. KNUTH DESCRIPTAE.

Geranium cruceroëense R. Knuth, sp. nov.—*Herba* annua, 30–40 cm. alta, multicaulis. *Radix* saepe longissima. *Caules* numerosi, e basi ramosissimi, 1.5–2 mm. crassi, retro-pilosi, ascendentes, internodiis 3–10 cm. longis. *Folia* numerosa; lamina ambitu 5-angularata, 2–3.5 cm. diam., supra minute adpresse pilosula, subtus ad nervos hirtula, fere usque ad basin 5-partita; lobi ambitu rhomboidei, profunde pinnatifido-incisi, lobulis oblongo-linearibus acutiusculis; petiolus 1–8 cm. longus, exsicc. 1 mm. crassus, minute hirtulus. *Stipulae* lanceolato-angustatae, 4 mm. longae, basi 1.7 mm. latae. *Pedunculi* ex axillis foliorum numerosi, 1–8 cm. longi, 1 mm. crassi, sicut pedicelli bracteaque pilis longis glandulosis densissime obsiti, glandulis deciduis. *Bractaeae* 2.5–3 mm. longae, lineari-subulatae. *Pedicelli* 5–7 mm. longi. *Sepala* 4 mm. (sub fructu 5 mm.) longa, ovata, plus minusve acuminata, minute cartilagineo-mucronata. *Petala* albida, sepalis 2-plo longiora, cuneata, antice leviter emarginata. *Stamina* glabra, sepalis aequilonga. *Pistillum* hirtulum. *Fructus* 15 mm. longus, pilis glandulosis satis longis hirtellum.—Ex affinitate *G. dissecti* L.

STATE OF MEXICO. District of Temascaltepec: Crucero Agua Blanca, on the llano, 3250 m., Aug. 1933, *Hinton* 4617 (typus in herb. Kew.), "flower white"; Crucero, 2880 m., July 1933, *Hinton* 4188.

Geranium lilacinum R. Knuth, spec. nov. (Sect. *Mexicana* R. Knuth).—*Herba* tenera, multicaulis, perennis. *Caules* ascendentes, 40–50 cm. longi, exsicc. 1.5 mm. crassi, inferne subglabri, partibus media et superiore dense vel densissime glandulis longe stipitatis obsiti, internodiis infimis usque 12 cm. longis. *Folia* satis multa; lamina 3-angularis, saepe 3.5 cm. longa lataque, subtus ad nervos nervulosque et supra pilis simplicibus setulosis obsita, usque ad 6/7 vel fere ad basin 3 (–5)-partita, lobis ambitu anguste rhomboideis grosse serrato-laciniatis, laciniis plus minusve oblongis acutis; petioli foliorum inferiorum quam lamina 2-plo longiores, exsicc. 0.8 mm. crassi, patule vel retrorso-patule hirsuti. *Pedunculi* solitarii ex axillis foliorum, 3–4.5 cm. longi, petiolis aequicrassi, sicut bractaeae pedicelli calycesque dense vel densissime glandulosi, 2-flori. *Bractaeae* 4 mm. longae, e basi latiore subulatae. *Pedicelli* 5 mm. longi, 0.7 mm. crassi. *Sepala* ovato-oblonga vel oblonga, 6 mm. longa,

* Continued from K.B. 1937, 457. † Continued from K.B. 1937, 457.

2.5 mm. lata, mucrone 1-2 mm. longo filiformi terminata. *Petala* 1.3-1.4 cm. longa, e basi anguste cuneata, obovata, antice cordato-incisa, pallide violaceo-purpurea. *Stamina* basi simpliciter pilosa, ceterum glabra.

STATE OF MEXICO. District of Temascaltepec: Sierrita, in pine forest, Feb. 1936, *Hinton* 8945 (typus in herb. Kew.); Hornos, in a wet barranca, Jan. 1935, *Hinton* 7199.

Geranium pinetorum R. Knuth, sp. nov.—*Herba* perennis, 24-25 cm. alta. *Rhizoma* 2-3 mm. crassum, obliquum, obscure brunneum. *Folia* basalia vix numerosa; lamina facie utraque setoso-pilosa, ad 7 cm. longa et 9 cm. lata, ambitu rotundato-angulata, usque ad 4/5-6/7 partita; lobi 5, late rhomboidei, ad 5.5 cm. longi et 3.5 cm. lati, grosse pinnatifido-incisi, dentibus latis vel latissimis minutissime mucronulatis; petiolus ad 20 cm. longus, saepe multo brevior, lamina saepe 1-2-plo longior, exsicc. 1.5 mm. crassus, pilis retrorsis plus minusve hirsutus; stipulae lineari-lanceolatae, acutissimae, ad 1 cm. longae. *Caules* pauci, tenues, basi exsicc. 2-2.5 mm. crassi, pilis retrorsis plus minusve hirsuti, paucifoliati, foliis quam basalia multo brevius petiolatis, internodiis infimis brevibus, sequentibus longissimis ad 35 cm. longis. *Pedunculi* pauci, ex axillis foliorum summorum, petiolis similes, sicut pedicelli dense glanduloso-pilosi, 4-10 cm. longi, graciles, 2-flori. *Bractae* lineari-subulatae, 5-10 mm. longae, acutissimae. *Pedicelli* 2-6 cm. longi. *Flos* 2-2.5 cm. diametro. *Sepala* ovato-oblonga, pilis longis glandulosis demum simplicibus dense obsita, 8 mm. longa, mucrone 2 mm. longo terminata. *Petala* albida vel rosea, 1.3-1.5 cm. longa, cuneato-obovata, antice retusa vel levissime emarginata, basi longissime pilosa. *Stamina* pilosa. *Pistillum* subhirsutum. *Fructus* 2.7 cm. longus, primo glanduloso-hirsutus, demum (glandulis deciduis) simpliciter pilosus.—Ex affinitate *G. crenati* S. Wats.

STATE OF MEXICO. District of Temascaltepec: Mesón Viejo, 2830 m., in pine forest, Oct. 1932, *Hinton* 1887 (typus in herb. Kew.); Hornos, in a wet barranca, Jan 1935, *Hinton* 7199. Salazar, Federal District, 1907, *Seler* 5282 (Herb. Berol.) San Rafael, District of Tlalmanalco, 1907, *Seler* 5321 (Herb. Berol.).

Geranium temascaltepecense R. Knuth, sp. nov.—*Herba* perennis, ad 40 cm. alta. *Rhizoma* 5 mm. crassum, plus minusve perpendiculare, brunneum. *Folia* basalia numerosa; lamina glabra, ad 4 cm. longa et 7 cm. lata, ambitu rotundato-reniformis, usque ad 6/7-7/8 partita; lobi 5, ambitu plus minusve rhomboidei, ad 3-5 cm. longi et 2.75 cm. lati, grosse pinnatifido-incisi, dentibus inferioribus ad 4 mm. longis et 3 mm. latis obtusis vel rotundatis minutissime mucronulatis; petiolus ad 16 cm. longus, quam lamina 5-plo longior, exsicc. 1.5 mm. crassus, sparsim adpresse pilosus; stipulae lineari-lanceolatae, ad 8 mm. longae. *Caules* pauci, tenues, basi 1.5 mm. crassi, retro-adpresse pilosi, paucifoliati, foliis caulinis quam basales brevius

petiolatis, foliis summis saepe subsessilibus, internodiis ad 11 cm. longis. *Pedunculi* pauci, ex axillis foliorum summorum, petiolis similes, sparsim glanduloso-pilosuli, 10–20 cm. longi, graciles, 2-flori. *Bracteae* lineares, acutae, 5 mm. longae. *Pedicelli* 1–6 cm. longi, glanduloso-puberuli. *Flos* 3 cm.* diametro. *Sepala* ovato-oblonga, 8–9 mm. longa, setosiusculo-pilosa, mucronata, mucrone 1–1.5 mm. longo. *Petala* pallide rosea, 1.7 cm. longa, cuneato-obovatâ, antice leviter emarginata. *Stamina* 7–8 mm. longa; filamenta sparsim longe pilosa. *Pistillum* sericeo-hirsutulum. *Fructus* 2.7 cm. longus, hirsutus.—Ex affinitate *G. Fremontii* Torr.

STATE OF MEXICO. District of Temascaltepec: Las Mesas, 2000 m., Aug. 1932, *Hinton* 1327 (typus in herb. Kew.); Nanchititla, in oak woods, Aug. 1933, *Hinton* 4533, "flowers pink, milky sap."

ADDITIONAL RECORDS OF GERANIUM (A. A. Bullock).

The following additional species and specimens of *Geranium* were collected by Mr. Hinton. Unless otherwise stated, they have been determined at Kew by the writer.

Geranium Hernandezii Sessé et Moc. ex DC. in DC. Prodr. 1, 640 (1824); Hanks et Small in N. Amer. Fl. 25, 12 (1907); R. Knuth in Engl. Pflanzenr. Geraniaceae, 193 (1912).

STATE OF MEXICO. District of Temascaltepec: Comunidad, Aug. 1932, *Hinton* 501; Anonas, 880 m., on a dry hill, March 1933, *Hinton* 3567; Tule, in oak woods, July 1934, *Hinton* 6250; Mesón Viejo, in pine forest, Jan. 1935, *Hinton* 7220, "flower white, with red veins"; Cajones, 2520 m., in a barranca, April 1935, *Hinton* 7470; Hornos, in pine woods, Feb. 1936, *Hinton* 8913; La Labor, near water, Feb. 1936, *Hinton* 8927.

This is now a very well known species, and is at once distinguished by its large white flowers. The subulate filaments of the stamens are erect and hairy at the base, but curve outwards fountain fashion above, so that the large anthers appear to be almost pendulous.

Geranium mexicanum H.B.K. Nov. Gen. et Sp. 5, 178 (182); R. Knuth l.c. 197, incl. "species americanae ex affinitate *G. mexicanum* (sec. Hanks et Small)."

STATE OF MEXICO. District of Temascaltepec: Tempincla, April 1932, *Hinton* 483; San Miguel, 2740 m., Sept. 1932, *Hinton* 1723, "1 m. high; *ibid.*, 2770 m., on a stone fence, Oct. 1933, *Hinton* 4915; Cumbre de Tejupilco, 2000 m., in a barranca, Nov. 1932, *Hinton* 2677; *ibid.*, Nov. 1934, *Hinton* 7019; Ocotepec, about 1500 m., by water, Nov. 1932, *Hinton* 2891; Crucero Agua Blanca, 3170 m., on the llano, Aug. 1933, *Hinton* 4621, "flower pink."

The multiplicity of "species" into which Hanks and Small divided this widespread and variable plant appear to overlap each other so completely that their strict delimitation is an impossible

* See also next page.—A.A.B.

task. It seems advisable, therefore, to retain only one name for the whole group.

Geranium potentillifolium DC. in DC. Prodr. 1, 639 (1824); Hanks et Small *l.c.* 20; R. Knuth *l.c.* 172.

STATE OF MEXICO. District of Temascaltepec; Las Cruces, 3350 m., in pine forest, May 1932, *Hinton* 782; *ibid.*, May 1933, *Hinton* 3988; *ibid.*, 3400 m., June 1934, *Hinton* 6079.

This is a very beautiful plant with large brightly coloured purple flowers and finely dissected leaves, silvery below, which are aptly described by the specific epithet. Mr. Hinton's 6079 shows the large woody rootstock particularly well.

Geranium Richardsonii Fisch. et Trautv. in Ind. Sem. Petrop. 4, 37 (1838); R. Knuth *l.c.* 114.

STATE OF MEXICO.—District of Temascaltepec: Cumbre Trojes, in pine forest, Sept. 1935, *Hinton* 8271; Mesón Viejo, in a barranca, Oct. 1935, *Hinton* 8339.

These specimens were determined by Dr. R. Knuth, and appear to represent a new southern record for the species.

Geranium temascaltepecense R. Knuth, *supra*, p. 503.

STATE OF MEXICO. Cucha, District of Temascaltepec, in oak woods, Aug. 1934, *Hinton* 6393. Pazquaro, 1839, *Hartweg* 373* (in herb. Hook. et herb. Benth.). Without locality, 1830, *Graham* 152 (in herb. Benth.).

This very distinct species was well represented at Kew by the Hartweg and Graham collections before Mr. Hinton's excellent material came to hand. With flowers 3.5–4 cm. in diameter, borne in pairs on long peduncles well above the leaves, from a tufted rootstock, it should prove to be of some horticultural value.

LXI—CONTRIBUTIONS TO THE FLORA OF SIAM.

ADDITAMENTUM XLV.

Symplocos ferruginea Roxb. var. **glabra** Fletcher [Symlocaceae]; a typo foliis glabris differt.

Kaw Samui, *Put* 734. Satul, Terutao, c. 5m., evergreen forest, *Kerr* 14207. Lam Saka, under 50 m., scrub, *Kerr* 15397 (*type of var.*). Pattani, Kao Kalakiri, c. 800 m., evergreen forest, *Kerr* 7808.

Symplocos impressa Fletcher [Symlocaceae]; *S. rigidae* C. B. Clarke affinis sed floribus pedicellatis nec sessilibus, bracteis minoribus differt; nec non *S. racemosae* Roxb. affinis sed foliis maioribus majus denticulatis disco hirsuto haud glabro differt.

Arbor circa 7 m. alta (ex *Kerr*); ramuli teretes, saepe verrucosi, glabrescentes, cortice griseo vel griseo-brunneo obtecti. *Folia*

* There is a line passing through the number, but it is not possible to say whether this is accidental, or means "delete."

lanceolata vel oblongo-lanceolata vel elliptica, apice late obtusa, basi attenuata, 10–20 cm. longa, 3–6 cm. lata, rigide coriacea, utrinque glabra, flava vel flavo-viridia, subtus pallidiora, costa supra leviter impressa subtus valde prominente, nervis lateralibus 6–8-paribus supra subconspicuis vel leviter impressis subtus prominentibus intra marginem anastomosantibus, margine modo argute denticulata modo valde denticulata, petiolo 1–2 cm. longo supra canaliculato leviter pubescente vel glabro suffulta. *Racemi* simplices, axillares, 3–6 cm. longi, fulvo-pubescentes; pedicelli minuti vel 2 mm. longi; bracteae mox deciduae, ovatae, 3 mm. longae, 2 mm. latae, extra adpresse pubescentes, intra glabrae vel sparse puberulae, ciliatae. *Sepala* late ovata vel subrotundata, 1–5 mm. longa et lata, dorso puberula, intra glabra. *Corolla* alba (ex *Kerr*), segmentis oblongo-ellipticis 5–6 mm. longis 3 mm. latis apice rotundatis, tubo 0.5 mm. alto. *Stamina* co pentadelpa; filamenta ad 7 mm. longa, gracilia, glabra, antheris parvis. *Ovarium* semi-inferum; stylus 4 mm. longus. *Discus* conspicuus, 5-angularis, hirsutus.

Krabin, Watana, c. 50 m., open deciduous forest, *Kerr* 9789.

Symplocos Kerrii *Craib* var. **glabra** *Fletcher* [Symplocaceae]; a typo ramulis foliis fructibusque glabris differt.

Chiengmai, Doi Pa Kao, c. 1800 m., evergreen forest, *Kerr* 5390 (type of var.).

Symplocos longifolia *Fletcher* [Symplocaceae]; *S. rigidae* C. B. Clarke affinis sed spicis glabris vel puberulis haud pubescentibus, fructibus minoribus ovatis haud oblongo-ellipsoideis differt.

Frutex circa 5 m., altus (ex *Winit*); ramuli teretes vel complanati, glabrescentes, cortice brunneo vel griseo-viridio obtecti, lenticellis conspicue elevatis. *Folia* oblongo-elliptica vel late lanceolata, apice attenuata, acuta, basi cuneata vel attenuata, 15–40 cm. longa, 5–9 cm. lata, utrinque glabra, viridia, subtus pallidiora, costa supra valde impressa subtus prominente, nervis lateralibus 6–10-paribus, supra impressis subtus prominentibus intra marginem anastomosantibus, nervulis subtus prominulis, margine denticulata mox recurva, petiolo 1.5–2 cm. longo glabro supra canaliculato suffulta. *Spicae* simplices, axillares, 2–5 cm. longae, glabrae vel minute puberulae; bracteae mox deciduae, ovatae, 5–6 mm. longae, 3–4 mm. latae, acutae vel obtusae, extra adpresse puberulae, intra glabrae, margine sparse ciliatae. *Sepala* late ovata vel subrotundata, 2 mm. longa, 1.5 mm. lata, apice obtusa, incurva, extra adpresse puberula, intra glabra. *Corolla* alba (ex *Winit*) segmentis ellipticis vel oblongo-ellipticis 5 mm. longis 2–2.5 mm. latis apice rotundatis, tubo circa 1 mm. alto. *Stamina* co, indistincte pentadelpa, filamenta ad 7 mm. longa, gracilia, glabra, antheris parvis. *Ovarium* semi-inferum; stylus 5 mm. longus. *Discus* conspicuus, hirsutus. *Fructus* ovatus, basi

7 mm. diametro, apice 2 mm. diametro, lobis calycinis discum superantibus.

Lampun, Mê Li, c. 600 m., small evergreen tree near stream, fruit greenish to white, tinged purple, *Winit* 230. Lampang, Me Yom, evergreen forest, flowers white, scented, *Winit* 1435 (*type*).

Symplocos magnifica *Fletcher* [Symplocaceae]; *S. confusae* Brand affinis sed floribus racemisque foliisque multo majoribus, nervis lateralibus paucioribus validioribus differt; nec non *S. Maingayi* Benth. ex C. B. Clarke affinis sed foliis ramulisque glabris haud ferrugineo-villosis, floribus majoribus differt.

Arbor procera (ex *Garrett*); ramuli obtuse quadrangulares, glabrescentes, cortice cinereo vel cinereo-brunneo rugoso obtecti. *Folia* elliptica vel oblongo-elliptica vel leviter obovata, apice acuta, basi cuneata vel late cuneata, 15–20 cm. longa, 5.5–9 cm. lata, chartaceo-coriacea, utrinque brunnea, glabra, subtus glandulosa, costa supra impressa subtus prominente, nervis lateralibus circa 8-paribus supra leviter impressis vel subconspicuis subtus prominentibus, parallelis, intra marginem anastomosantibus, nervis transversis paucis irregularibus, margine integra leviter recurva, petiolo circa 2 cm. longo supra canaliculato glabro vel minute puberulo leviter rugoso suffulta. *Racemi* simplices, axillares, pubescentes, 4–6-flori, subumbellati. *Calycis* tubus campanulatus extra cinereo-pubescent, 2–2.5 mm. altus; lobi 5, late ovati, 2.75–3 mm. lati, 2 mm. longi, apice rotundati, intra sericei, margine ciliati. *Corolla* alba (ex *Garrett*); tubus 2.3–2.5 cm. longus; lobi 5, oblongi, 2 cm. longi, 0.4 cm. lati, apice rotundati, glabri. *Stamina* co alte corollae adnata, filamentis in tubum apice truncatum corollae tubo longiorem connatis, antheris numerosis parvis intra partem superiorem tubi staminei irregulariter multiseriatis breviter stipitatis. *Ovarium* semi-inferum; stylus 3.8–4 cm. longus, adpresse aureo-pilosus. *Discus* inconspicuus, leviter hirsutus.

Easterly spur of Doi Angka, ending in Doi Pa Mawn, c. 1420 m., *Garrett* 402.

A very distinct plant, differing from all others in the subgenus *Cordyloblaste* in the much larger flowers and the correspondingly greater length of the staminal tube.

Symplocos megalocarpa *Fletcher* [Symplocaceae]; *S. macrocarpae* Wight ex C. B. Clarke affinis sed spicis glabris haud fulvo-pubescentibus differt; nec non *S. cerasifoliae* Wall. affinis sed spicis glabris haud villosis, foliis maioribus obovatis nec oblongis differt.

Arbor circa 15 m. alta (ex *Kerr*); ramuli quadrangulares vel teretes, glabrescentes, cortice brunneo obtecti, lenticellis paucis parvis vix elevatis. *Folia* obovata aliquando oblongo-elliptica, apice obtusa, basi attenuata vel cuneata, 10–20 cm. longa, 4–8 cm. lata, coriacea, utrinque viridia subtus pallidiora, supra glabra, costa subtus leviter pilosa, costa supra leviter impressa vel subconspicua, subtus prominente, nervis lateralibus 10–12-paribus

supra subconspicuis subtus prominentibus intra marginem arcuatim junctis, nervis transversis numerosis parallelis, margine denticulata subinde saepe crenulata, petiolo 1.5–3 cm. longo supra canaliculato glabro suffulta. *Spicae* petiolum aequantes vel petiolo duplo longiores, 1.5–4 cm. longae, glabrae; bracteae mox deciduae, obovatae, carinatae, dorso sparse adpresse pubescentes, intra glabrae, margine ciliatae. *Sepala* ovata vel elliptica, 4–5 mm. longa, 2–3 mm. lata, dorso adpresse pubescentes, intra glabra. *Corolla* alba (ex *Kerr*) non visa. *Ovarium* semi-inferum; stylus 7 mm. longus. *Discus* conspicuus, glaber, 5-angularis. *Fructus* ellipticus vel oblongo-ellipticus, 3–4 cm. longus, 1.5 cm. diametro, 3-loculatus.

Loi, Dan Sai, Kao Kêo Kang, c. 1300 m., evergreen forest, *Kerr* 5793.

***Symplocos sempervirens* Fletcher** [Symplocaceae]; *S. Hookeri* C. B. Clarke affinis sed foliis ellipticis haud obovatis magis coriaceis, nervis supra majus impressis, racemis pubescentioribus differt.

Arbor parva, semperviva, circa 8 m. alta (ex *Garrett*); ramuli obtuse quadrangulares, glabrescentes, cortice brunneo obtecti, lenticellis paucis haud elevatis. *Folia* elliptica vel oblongo-elliptica, apice acuta, basi attenuata vel cuneata, 10–15 cm. longa, 3.5–7 cm. lata, rigide coriacea, utrinque glabra, brunnea, nitida, costa supra valde impressa subtus prominente, nervis lateralibus circa 8-paribus, supra impressis subtus prominentibus intra marginem arcuatim junctis, nervulis transversis subtus prominulis parallelis, margine argute denticulata leviter recurva, petiolo 2–2.5 mm. longo glabro supra complanato suffulta. *Racemi* simplices, axillares, 2–4 cm. longi, aureo-pubescentes; pedicelli 2 mm. longi; bracteae late ovatae vel ellipticae, circa 6 mm. longae, 5 mm. latae, extra adpresse pubescentes, intra glabrae; receptaculum, 1.5–2 mm. altum, glabrum. *Sepala* late ovata, apice rotundata, 1.5 mm. longa, 2 mm. lata, glabra, 3.5 nervata. *Corolla* viridi-alba (ex *Garrett*), circa 10 mm. diametro, segmentis oblongo ellipticis 5 mm. longis 3 mm. latis apice rotundatis, tubo 0.75 mm. alto. *Stamina* ∞ indistincte pentadelpha; filamenta ad 6 mm. longa, gracilia, glabra, antheris parvis. *Ovarium* semi-inferum, stylus 4 mm. longus. *Discus* conspicuus, 5-angularis, hirsutus.

Doi Pa Kao, Mê Hawngka drainage, wood whitish, *Garrett* 709.

***Styrax apricus* Fletcher** [Styracaceae]; *S. siamensi* Fletcher affinis sed fructibus dehiscentibus floribus minoribus differt; nec non *S. benzoidi* Craib affinis sed foliis minoribus, indumento foliarum longiore ramulis crassioribus differt.

Arbor parva (ex *Kerr*); ramuli teretes, primo stellato-villosi, mox glabrescentes, cortice brunneo vel nigro irregulariter longitudinaliter fisso obtecti. *Folia* ovata vel elliptica vel ovato-lanceolata, apice acuminata, acuta vel obtusa, basi cuneata vel late

cuneata, 6–12 cm. longa, 3–5 cm. lata, chartacea vel chartaceo-coriacea, supra brunnea viridi-tincta, subtus cinerea vel cinereo-brunnea, supra glabra costa basi excepta, subtus dense stellato-villosa, costa supra impressa subtus prominente, nervis lateralibus 5–6-paribus supra leviter impressis subtus prominentibus intra marginem anastomosantibus, nervis transversis numerosis parallelis margine integra leviter recurva, petiolo 5–10 mm. longo supra canaliculato villosa suffulta. *Inflorescentia* racemosa vel paniculata, 5–10 cm. longa, terminalis vel axillaris; rachis furfuraceo-vel cinereo-stellato-villosa; bractae mox caducae; pedicelli circa 5 mm. longi, stellato-villosi. *Calyx* truncatus vel minute dentatus, 3 mm. altus, intra superne tenuiter sericeus extra stellato-villosus. *Corolla* alba (ex Kerr) extra albo-tomentosa; tubus 4 mm. longus; lobi 5, lanceolati, 10 mm., longi, 2 mm. lati, intra superne subsericei. *Filamenta* 3 mm. longa, albo-pilosa; antherae 4.5 mm. longae, pilis stellatis parce munitae. *Ovarium* circiter 2 mm. altum, albo-pilosum; stylus 7–8 mm. longus. *Fructus* ad 1.5 cm. altus, pericarpio extra cinereo-tomentello, 1 mm. crasso in valvas tres regulariter dehiscente.

Loi, Pu Tong, c. 1000 m., open grassy forest, Kerr 8966. Loi, Kao Krading, c. 1200 m., open forest, Kerr 20133. Dan Sai, Hui Nam Man, c. 600 m., savannah and open deciduous forest, Kerr 5810 (*type*) 5810a.

***Styrax betongensis* Fletcher** (Styracaceae); *S. serrulato* Roxb. affinis sed fructibus indehiscentibus, foliis majoribus subtus stellato-tomentosis haud glabris differt.

Arbor circa 10 m. alta; ramuli teretes primo stellato-tomentelli, mox glabri, cortice brunneo irregulariter longitudinaliter fissi obtecti. *Folia* ovata vel late elliptica, apice acuta, basi late cuneata vel subrotundata, 7–14 cm. longa, 4–9 cm. lata, chartacea, utrinque brunnea subtus pallidiora, costa et aliquando nervis lateralibus supra stellato-pubescentibus aliter glaber, subtus dense stellato-tomentosa, nervis supra subconspicuis, costa subtus prominente, nervis lateralibus utrinque 6-paribus subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis numerosis parallelis, margine subintegra vel minute denticulata, petiolo 5–8 cm. longo supra complanato dense ferrugineo-stellato-villoso suffulta. *Inflorescentia* racemosa, axillaris vel terminalis, 3–6 cm. longa; rachis furfuraceo-stellato-villosa; pedicelli 3–5 mm. longi, stellato-villosi. *Calyx* truncatus vel minute dentatus, 5 mm. altus, intra superne tenuiter sericeus inferne glaber, extra stellato-tomentosus. *Corolla* alba (ex Kerr); tubus 4 mm. longus; lobi 5, ovati vel ovato-oblongi, circa 10 mm. longi, 4.5–5 mm. lati, intra et extra minute sericei. *Filamenta* 4 mm. longa, apice geniculata, albo-pilosa; antherae 5 mm. longae. *Ovarium* 0.75 mm. altum, 5-angulatum, adpresse albo-pubescentis; stylus 15 mm. longus. *Fructus* ad 1.5 cm. altus, pericarpio extra cinereo-tomentello corrugato 1–2 mm. crasso indehiscente.

Pattani, Betong, c. 200 m., scrub jungle, gum not collected from this plant, *Kerr* 7494.

***Styrax siamensis* Fletcher** [Styracaceae]; *S. benzoin* Dryand, pericarpio indehiscente affinis sed foliis minoribus, nervis lateralibus paucioribus, inflorescentiis brevioribus fructibus majoribus differt.

Arbor circa 15 m. alta (ex *Kerr*); ramuli graciles, obtuse quadrangulares, primo stellato-tomentelli, mox glabri, cortice brunneo vel cinereo-brunneo irregulariter longitudinaliter fissi obtekti. *Folia* elliptica vel leviter ovato-lanceolata, apice attenuata, acuta vel obtusa, basi cuneata vel late cuneata, 5–10 cm. longa, 2–4 cm. lata, chartaceo-coriacea, utrinque brunnea vel cinereo-brunnea, subtus pallidiora, supra glabra, subtus dense griseo-fusco-stellato-tomentosa, nervis supra subconspicuis, costa subtus prominente, nervis lateralibus circa 6-paribus subtus prominulentiis intra marginem anastomosantibus, nervis transversis numerosis plus minusve parallelis, margine integra recurva, petiolo circa 7–10 mm. longo supra valde canaliculato indumento ut foliorum pagina inferiore suffulta. *Inflorescentia* racemosa, 3–4 cm. longa; rachis breviter fusco-stellato-tomentosa; pedicelli 2 mm. longi indumento ut calyce corollaque extra et foliorum pagina inferiore. *Calyx* truncatus vel minute dentatus, 5 mm. altus, intra tenuiter sericeus. *Corolla* alba (ex *Kerr*); tubus 8 mm. longus; lobi 5, lanceolati, 12–14 mm. longi, 3 mm. lati, intra superne subsericei, inferne paucissime adpresse pubescentes. *Filamenta* 5 mm. longa, albo-pilosa; antherae 6 mm. longae, pilis stellatis parce munitae. *Ovarium* 1.5 mm. altum, adpresse albo-pubescent; stylus 17 mm. longus, basi puberulus. *Fructus* globosus 2 cm. diametro, pericarpio extra cinereo-tomentello 1 mm. crasso indehiscente.

Kao Luang, c. 1200–1300 m., common in evergreen forest, *Kerr* 15493 (*type*) 15493a.

LXII—TEPHROSIA MACROPODA AS A POSSIBLE INSECTICIDAL PLANT. F. N. HOWES.

This species is known in Natal and elsewhere in south-east Africa as a fish-poison plant (2). It is common in some parts of the coastal grass-veld of Natal. As legislation exists against its use in poisoning fish it is probably used less for this purpose now than it was formerly. In earlier days in Natal, an infusion of the roots with water was commonly used by settlers as a wash for freeing dogs from fleas and ticks. The root has also been used for medicinal purposes by the Zulus and as a vermin-killer for destroying lice on the head, the roots being boiled and the head washed in the decoction, or a paste made of the ground roots and well rubbed into the hair (1).

The roots of the plant have attracted a certain amount of attention as a possible insecticide in recent years (3). It would appear

that samples of the root investigated in the past have been obtained from plants growing in the wild state and that little is known regarding the plant and its habits or its behaviour under cultivation. Furthermore, as it is possible that it might be desired eventually to grow the plant on a field scale, it was considered advisable at this stage to find out more about the plant itself and its characteristics.

The Mycologist in Charge at the Natal Herbarium, Durban (Dr. A. P. D. McClean), kindly undertook to establish a small plot for observation and supplied most of the information that is given here. From these cultivated plants dried roots were obtained and their insecticidal properties investigated by the Department of Insecticides and Fungicides, Rothamsted Experimental Station.

At the outset it was thought the following were some of the points on which information was desired: (1) the period of growth of the plant—whether annual, biennial or perennial; (2) whether propagation could be effected easily by vegetative means (cuttings) and, if so, whether plants so raised mature earlier than those raised from seed; (3) the average weight of root-stock per plant after one and two or more years growth respectively; (4) the growth form of the plant under cultivation—average height and spread—as this would have a bearing on suitable planting distances.

A plot was established from seed in the grounds of the Natal Herbarium in the latter half of 1934. "The plot consisted of 12 rows, approximately 7 yards in length, and about 2 feet between the rows. The seed was sown directly in the rows—no attempt was made subsequently to thin out the plants. Germination was good. Growth was very slow in the early stages, and after three months the plants were not more than a few inches in length. The rate of growth increased during the summer and was rapid during January and February, the branches ultimately spreading a distance of 1 to 2 feet. The plants in six rows were uprooted about the middle of June and then air-dried." The air-dried roots weighed 3 lb. 10 oz. and the aerial parts 2 lbs. In the remaining rows the plants were uprooted after completing two years' growth. The site was not regarded as a desirable one owing to poor soil conditions and partial shading in the afternoon. The most suitable method of propagation was found to be by seed sown directly in the rows. The plant proved to be definitely perennial with a tendency for the aerial branches to die back partially during the winter months (June–August) when most of the leaves were shed. In the following spring growth was resumed from the living portions of the aerial branches of the previous season. The plant was found to possess a weak habit with branches spreading along the ground, some of which reached a length of three feet after the first season's growth. Plants flowered freely in the first year and set an appreciable quantity of seed. A plot established at the Sugar Experiment Station on the Natal coast, where better soil conditions

were available, proved to be a failure mainly owing to high mortality, from, it was thought, some form of root disease.

The roots harvested after two years' growth were a good deal larger than those from one season's growth, the average weight of a few specimens (air dried) taken at random being—for one year's growth $\frac{3}{4}$ oz. approx., and for two years' growth $2\frac{1}{2}$ oz. In the fresh state the roots are somewhat fleshy and tuberous, there being as a rule, a single main root to each plant. The roots are long and tapering with the thickest part just below soil level and more often unbranched or but little branched. The dried two year old roots received were mostly two to two-and-a-half feet in length and one inch in diameter at the thickest part. They were markedly larger and less contorted or twisted than roots collected in the wild state (at Scottburgh, Natal) by the writer some years ago, this being probably due to their having been grown in a deep, well tilled soil.

The results of the testing of the one and two year old cultivated roots at Rothamsted were as follows.

Concentration in percentages of root.	2 year old roots tested June, 1937, % paralysed and dead insects.	1 year old roots tested July, 1936, % paralysed and dead insects.
0.5	100	100
0.25	100	96
0.2	—	92
0.1	50	14
0.075	20	—
0.05	—	—
0.025	—	—
Control Saponin 0.5 per cent. wt./vol.	3	3.8
Alcohol 5 per cent. by vol.		

The figures suggest an improvement in insecticidal value due to the second year's growth in which respect the plant shows similarity with *Derris*. However, the insecticidal value of these samples of roots from cultivated plants was regarded as insufficient to warrant the belief that they would compete with *Derris* root in the European or American market, although it was thought the roots might be of use locally, probably as a dust.

A comparison of these figures with similar figures obtained in earlier tests (3) with roots from other sources in Natal shows apparent differences in the degree of toxicity. It is possible, therefore, that forms or varieties of the plant with varying degrees of toxicity exist and it is not unreasonable to suppose that, by selection or breeding, strains with superior insecticidal properties might be obtained, as has been done with *Derris*. The fact that the plant flowers and sets seed readily in its first season under normal conditions and can be propagated vegetatively, may be an advantage should work of this sort be undertaken at any time.

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LXIII—MISCELLANEOUS NOTES.

SIR HERBERT EUSTACE MAXWELL.—With the passing of Sir Herbert Maxwell, Bt., K.T., F.R.S., whose death occurred at Monreith, his home in Wigtownshire, on October 30th, a unique figure in horticulture has gone from our ken. He was nearly 93 years of age, and his eminence was such that he might rightly, towards the end of his career, be regarded as the Nestor of gardening.

It was probably the singularly favourable climatic conditions of Monreith, which is situated on the south-west side of Luce Bay, that originated and developed his taste for horticulture, for it is one of those places where very many trees and plants can be grown which are impossible for the great majority of gardens in Britain. This fact enabled him to send to the press a steady flow of essays and notes—on rare trees and shrubs especially—that were always interesting and informative. Pure botany did not appeal to him, but his interest in a plant was certainly not restricted to its beauty or garden value; it extended to its peculiarities of structure, its behaviour under different conditions, and especially to its legendary or local associations.

He was a stickler for correct pronunciation of names and one never perpetrated a false quantity in his hearing without receiving a correction, or even a reproof, if the offence were flagrant enough. Although he went down from Oxford without taking a degree, he was strongly attached to the classics. Above or on the door lintels at Monreith were inscribed various adjurations and mottoes in Latin, and to the south of the house clipped box is planted so as to read "Homo quasi flos egreditur et conteritur" (Man cometh forth like a flower and like a flower is he crushed).

His writings in connexion with gardens and plants were only one item in his literary work. It would, indeed, be difficult to name any one of his contemporaries whose interests were more diverse. Whilst such of his books as "Memories of the Months," "Woodland Notes," "Trees," "Flowers," dealt wholly or very largely with plant life, others were concerned with history, biography, archaeology, topography, forestry, sport and various other subjects. He even published some half a dozen novels, mostly with a historical setting.

His relations with Kew were always cordial, and extended over the last thirty years. They were mostly concerned with the exchange

of plants on a "quid pro quo" basis. One of his noteworthy contributions was a hundred young plants of the Serbian spruce (*Picea Omorika*) which he had raised from native seed at a time when the tree was very rare in Britain. This is the best of the spruces in withstanding the effects of London smoke and the groups and odd specimens of it at Kew we owe to Sir Herbert.

No account of his activities would be complete without some mention of his artistic capabilities, more especially in the portraiture of flowers. He appears to have devoted himself to this work in his later and more leisured years. He had the faculty of presenting his subject with sufficient exactitude and detail to make it easily recognizable without losing its grace and charm, as purely botanical portraits are apt to do. Reproductions of his pictures in colour have appeared in "The New Flora and Silva" and "The Gardeners' Chronicle," and the originals have been exhibited in the Royal Horticultural Society's Hall at Westminster.

W. J. BEAN.

A New Species of *Streptocarpus*.—It has been realized for some time that there are a number of forms allied to *Streptocarpus polyanthus* Hook. which cannot be satisfactorily classified from the meagre herbarium material available, but which may well prove to represent two or three distinct species. *S. gracilis*, described below, is one of these and it is its introduction into cultivation in this country which has made it possible to recognize it as a new species.

It was grown at the John Innes Horticultural Institution at Merton from seed received from Kirstenbosch Botanic Garden (under the number 588/32) as *S. polyanthus*, but a plant presented to Kew flowered alongside the true *S. polyanthus* Hook., and is evidently quite distinct. *S. polyanthus* is well illustrated in the Botanical Magazine (t. 4850), and differs from *S. gracilis* in its larger, bluer flowers, broader corolla lobes and much stouter inflorescence. The seed of *S. gracilis* was originally obtained from Kloof, Natal, and a specimen collected by Sanderson at Fields Hill seems to belong to this species; this specimen was referred to *S. polyanthus* (Bot. Mag. t. 4850) by Hooker and to *S. pusillus* Harv. by C. B. Clarke, facts which serve to illustrate the difficulty of identifying dried specimens of this genus.

***Streptocarpus* (*Eustreptocarpus*) *gracilis* B. L. Burtt**, sp. nov.; *S. polyanthus* Hook. affinis, sed pedunculis gracilioribus, floribus minoribus, corollae tubo magis curvato lobis angustioribus facile distinguitur.

Herba acaulis, unifoliata. *Folium* basi cordatum, basin versus 8 cm. latum, crassum, utrinque densiuscule pubescens, nervis subtus valde prominentibus. *Inflorescentiae* plures e basi folii orientes, usque ad 15 cm. longae, pluriflorae, breviter et patule glanduloso-pubescentes. *Flores* bini, collaterales, bracteis duobus oppositis 1.5 mm. longis setoso-pubescentibus, pedicellis 1 cm. longis.

Calyx ad basin 5-partitus, segmentis lanceolatis 3 mm. longis breviter et rigide pubescentibus. *Corolla* pallide purpurea fauce flava; tubus 1 cm. longus, declinato-curvatus, fauce a lateribus compressus, intus breviter pubescens, extra glanduloso-pubescentibus; limbus obliquus, lobis oblongis vel oblongo-obovatis rotundatis intus et extra breviter pubescentibus, lobo anteriore 6 mm. longo et 4.5 mm. lato, antero-lateralibus 7.5 mm. longis et 4.5 mm. latis, postero-lateralibus 7 mm. longis et 3.5 mm. latis. *Stamina* 2, fertilia, filamentis crassis leviter curvatis basin versus brevissime pubescentibus medio corollae tubo insertis, antheris cohaerentibus bilocularibus, loculis divergentibus apicibus confluentibus. *Discus* annularis, undulatus. *Ovarium* cylindricum 4.5 mm. longum, appresse pubescens, multiovulatum. *Stylus* brevissimus, crassus, stigmatate capitato.

SOUTH AFRICA: NATAL. Kloof, 22 miles from Durban on the railway to Maritzburg; cultivated at the Kirstenbosch Botanic Garden, n. 588/1932 (spec. in herb. Bolus), at the John Innes Horticultural Institution, and at the Royal Botanic Gardens, Kew (type spec. in Kew herb.).

B. L. BURTT.

Further notes on Mexican Species of *Bursera.**—In view of the fact that sets of Mr. Howard Scott Gentry's Mexican plants have been distributed to various herbaria, the following notes may be of interest:—

No. 2245, *Bursera confusa* (Rose) Engl. There is no doubt that this is conspecific with No. 2266a, distributed as *B. confusa* (Rose) Bullock. As pointed out in Kew Bull. 1937, 448, this combination was made *de novo*, by an oversight, in Kew Bull. 1936, 356.

No. 2260, *Bursera laxiflora* S. Wats. This was distributed as *B. odorata* Brandeg. and is an evident misidentification. The specimen is exactly similar to the type-specimen of *B. concinna* Sandw., which was reduced to *B. laxiflora* by the writer in Kew Bull. 1936, 370. It is of interest to note that the present specimen is from Sonora, where the type of *B. laxiflora* was collected, whereas the type of *B. concinna* was collected in Sinaloa.

No. 2383, *Bursera stenophylla* Sprague et Riley. This was distributed as *B. bipinnata* (DC.) Engl., but it so closely matches the type of *B. stenophylla* that I have no hesitation in changing the identification. This new collection of a plant which I have previously suggested (Kew Bull. 1936, 376) might be of hybrid origin, in an area in which at least one of the suggested parents occurs, makes the collection of further specimens and data most desirable.

A. A. BULLOCK.

The Cabot Foundation for Botanical Research.—We are pleased to hear that Harvard University is the recipient of a fund of \$615,773 from Dr. Godfrey L. Cabot. The gift will be known as

* See Bullock in Kew Bull. 1936, 346-387, and Kew Bull. 1937, 352.

the Maria Moors Cabot Foundation for Botanical Research and will be devoted to a long range research programme for increasing the production of cellulose by plant breeding, especially tree breeding, and by improving forest soils. The donor foresees a time in the not very distant future when the world supplies of coal and oil approach exhaustion and wood will become one of the main sources of energy. The realization that such a state of affairs is not very remote is becoming widespread and the moment is an opportune one for setting in motion a research programme in tree breeding and its related problems, which will necessitate the patient work of several generations of investigators to bring to a successful end. The conditions of University work provide for the essential continuity necessary to achieve this object.

Work will be carried on mainly at the Harvard Forest, Petersham, Mass., the Arnold Arboretum and in the University Biological Laboratories. Professors E. M. East and Karl Sax will study hybridization and such problems as the doubling of the chromosome numbers with the object of increasing the size, vigour and hardiness of trees. Vegetative propagation will be in the care of Prof. K. V. Thimann and physiological problems, especially in mineral nutrition, will be the province of Prof. P. R. Gast.

Forest Reserves in the Seychelles.—We learn from Mr. F. L. Squibbs that an area of some 200 acres of mountainous country in the Island of Praslin has recently been acquired by the Government as a Forest Reserve. Previously to this an adjacent area of about 30 acres was set aside for permanent preservation through the generosity of the owner, Mr. France Jumeau. This latter area forms a natural gateway to one of the principal "Cocote Mer" valleys, the "Vallée de Mai," where nearly 4,000 trees of the double coconut have recently been counted.

Though containing a number of endemic trees, these reserves do not represent truly original forest, having been considerably modified by cutting and possibly burning. It is doubtful, indeed, if any virgin forest now exists in the Seychelles.

Plant Preservation in New Zealand.—We learn with interest that a Native Plant Preservation Society, Incorporated, has recently been formed, with headquarters at Lower Hutt, Wellington. The objects of the Society are (a) the preservation both in nature and in cultivation of rare plants indigenous to New Zealand and its outlying islands, (b) the cultivation of such plants for experimental purposes and distribution, (c) the preservation of the indigenous flora generally and the discouragement of its destruction, (d) to take any other steps from time to time incidental or conducive to the attainment of the Society's objects, (e) to act in co-operation with the Government, or any Society or Institution, for the promotion

of the above objects. Further information can be obtained from the Secretary, P.O. Box 34, Petone, New Zealand.

Chronica Botanica.—We learn from the Editor that from February 1938 this publication will be issued bi-monthly and no longer as a year-book. The annual subscription will be reduced from 15 to 7 guilders. The new periodical will continue to give all the essential information which was given in the old year-book and will include some important new sections as well. Like the year-book the new *Chronica* will aim at promoting documentation, goodwill and international co-operation among plant scientists. Results of research will be published only in the first two sections. The world list of plant science institutions and societies will appear as an annual supplement. The contents of the reorganized *Chronica* will be as follows :—

1. *Scientific Communications* : a medium for the quick publication of short preliminary notes on the results of recent research or announcing new discoveries.
2. *Forum Botanicorum* : Discussions, Announcements, Letters to the Editor.
3. *International Congresses* : Detailed programmes, short reports, decisions, resolutions, etc.
4. *Quotations* : from recent articles of general and timely interest.
5. *Miscellaneous news* : News notes of all kinds of plant science institutions, experiment stations, gardens, etc., including notes on new research projects.
6. *Herbarium and Museum News* : Expeditions, new collections, lists of new acquisitions, etc.
7. *Personalia* : Appointments, Retirements, Resignations, Deaths (short obituaries), Miscellaneous, New Addresses.
8. *Queries* : Requests for co-operation and information, exchange offers.
9. *New Periodicals* : Short accounts of new plant science periodicals, changes in existing periodicals.
10. *New Books* : Short reviews of new plant science books.

Overseas Plant Products.*—Mr. J. H. Holland, the author of this work, was for over thirty years a member of the Museums staff at Kew. Before joining the Kew staff he was in the Agricultural Service in Nigeria (Southern Nigeria Protectorate), and is known to many as the author of "The Useful Plants of Nigeria." As stated in the Director's foreword, part of the author's official duties at Kew was the identification of samples of economic plant products of various types received mainly from commercial houses in this country. Such samples originate from all parts of the world, and although often accompanied by names by which they are

*By J. H. Holland. John Bale, Sons & Curnow, Ltd., London, 1937. Pp. 279. Price 6s. net.

known in the countries of origin, these names seldom afford any clue to the identity of the product.

For his own use the author commenced the compilation of a list which he drew up not only from specimens received at Kew for identification, but also from various publications and other sources. This work, which he completed after his retirement, has now appeared in book form. The information thus brought together with much care and trouble should prove of great use not only to Import and Export houses, but also to all those concerned with the raw materials of industry. It should also appeal to students of economic botany and geography, and, in fact, to all those interested or concerned with any of the various groups of useful plant products furnished by the vegetable kingdom, such as food-products, fibres, tans, drugs, spices, timbers, etc. In his preface the author expresses the hope that the information supplied "will be of value to Produce Importers at home or their agents in the various countries where they have commercial interests, and also to Commercial Intelligence Officers attached to British Embassies in Foreign Countries. It shows what is already on the markets, and will serve as a guide to our trade resources of raw materials in demand for various industries."

The arrangement throughout is alphabetical according to the common or trade name, these being correlated with the botanical name (specific and family), and information is given as to the sources or countries of production and uses. Under each of the general headings of main commercial commodities such as beans, dyes, gums, nuts, etc., an enumeration of the particular products or individual species concerned is given, for instance, under "dye-woods" are given camwood, fustic, logwood, redwood or barwood and sappanwood.

The following is an example of the value of the book and of the type of information supplied. A few years ago some kernels labelled "almondettes" were received at Kew from a commercial source. They were identified eventually as *Buchanania latifolia*, though the name "almondettes" afforded no assistance. On turning to "almondettes" in Holland's volume, the following information will be found:—" *Buchanania latifolia* (Anacardiaceae); India and Burma—in dry forests. The fruit contains an edible kernel—eaten as food in India and sometimes as dessert nuts, similar to 'Pistachio' nuts, by Europeans. An oil is also obtained from the kernels, which are known as 'Cuddapah Almonds' (Almondettes) and 'Peru Palm Kernels'—suggested for use in confectionery."

It is obvious, in view of the wide scope of the book, that it would be impossible to give full details of all the products dealt with in the space available. The very full bibliography, however, at the end of the volume indicates where further information on the various products may be obtained. The bibliography is arranged according to subjects, commencing with "Drugs, Medicinal and Culinary herbs." For statistics and conditions governing Imports

and Exports of the trade products mentioned, the reader is referred to the requisite official reports.

F. N. HOWES.

Flora of Southeastern Washington.—Professor St. John's book* is the result of studies made during nine years of residence in Pullman, Wash., and seven years of study since then. The author acknowledges his indebtedness to Piper and Beattie's *Flora of Southeastern Washington* (1914), which indeed he cites, for the sake of brevity, as "ed. 1." Whereas Piper and Beattie described 1139 Pteridophytes and Spermatophytes, St. John distinguishes 1473, of which 1187 rank as species, and 286 as subdivisions of species. The earlier work included 9 species and one minor group (under a trinomial, with rank unspecified) of *Epilobium*, while the new one recognizes 10 species, 5 varieties and 4 forms, all included in the clavis. *Epilobium franciscanum* of ed. 1 is referred to *E. Sandbergii*, *E. adenocaulon* and *E. occidentale* are treated as varieties of *E. glandulosum*, and *E. fastigiatum* as a variety of *E. glaberrimum*. These and similar examples which occur throughout the book, afford evidence of fresh intensive study, and justify its issue as a new work instead of as a new edition.

Five life zones are recognized: the Upper Sonoran, or zone of the arid regions; the Arid Transition Timberless, or zone of grass lands or prairies; the Arid Transition Timbered, or zone of the open yellow pine forests; the Canadian, or zone of moist dense woods on the middle slopes of the mountains; and the Hudsonian, or zone at the upper limit of trees on the mountains. Indicator species are listed for each of the life zones, but "detailed studies have shown that few, even of the indicator, plants are absolutely constant to one life zone. If their entire geographic range is considered, it is often found that they occur in two or more life zones. Also, if a number of indicator species of one zone are studied and their ranges mapped in detail, it will be seen that their ranges do not exactly coincide. Hence the life zones do not seem to be scientific concepts capable of precise definition. On the other hand they are generalizations of the mass association of plants characteristic of the great physiographic and climatic areas. They have a meaning and a use. To the naturalist, the name Upper Sonoran brings an indelible picture of hot, arid plains or canyons with sagebrush, cactus, jack-rabbits, and horned toads. The name Canadian brings an image of deep moist woods in the mountains, with the shade and fragrance of spruce, fir, and cedar."

For the purposes of general classification the author has followed the system of Engler and Prantl, which he considers to be the best hitherto published. He has deviated from it in only a few cases,

* "Flora of Southeastern Washington and of Adjacent Idaho." By Harold St. John, Professor of Botany, The State College of Washington, 1920-1929. Published by the Students Book Corporation, Pullman, Washington, 1937. Pp. xxv+531. Cloth, \$3.50; paper, \$3.00.

as in the acceptance of the *Lobeliaceae* and *Fumariaceae*, and the rejection of the *Cupressaceae*.

The nomenclature is stated to be in accordance with the International Rules of Botanical Nomenclature, ed. 3 (1935), with such modifications as were introduced at Amsterdam in 1935. Short Latin diagnoses are given, in order to validate publication of the name, after the English descriptions of new species, e.g., *Horkelia caeruleo-montana* St. John and *Glossopetalon stipuliferum* St. John. Errors in nomenclature and typography seem commendably few: *Brassica arvensis* (L.) Rabenh. is a later homonym of *B. arvensis* L. (1767), and the correct name for the species, under *Brassica*, is *B. Sinapistrum* Boiss. The specific epithet of *Matricaria matricarioides* should be spelt with a small initial letter, since it was merely a word signifying resemblance to a *Matricaria*, and was not a generic name used as a specific epithet.

The common names supplied are "either genuine folk names actually in current use in this area, or names of widely distributed species that are almost universally accepted." The author has shown good judgment in excluding book-made English names, such as the translations of the Latin names.

Analytical keys to the families are prefixed to the main body of the work, and a glossary of technical terms, and an explanation of authors' names, with their dates of birth and death, are appended. These are followed by a list of new species and combinations—a great boon to the bibliographer. Scientific and common names are sensibly included in a single index.

The final verdict on the merits of a new flora can of course be given only after testing it in the herbarium or the field, but inspection of Professor St. John's book suggests that it will prove to be a thoroughly practical handbook. Its publication adds materially to our knowledge of the flora of South-eastern Washington and Idaho.

T. A. SPRAGUE.

Chrysanthemums of Japan.*—The mystery surrounding the origin and development of the garden race of Chrysanthemums is taken a step further towards solution by Professor Niwa in his latest book. Originally published in 1936 in Japan for Japanese horticulturists, so much interest was taken in it that it has now been translated into English.

The credit for the raising of this wonderful race of plants rests with Japanese breeders, who have been cultivating them—as records show—for the last eight hundred years. According to the author there is a record that the Emperor Kwammu at an Imperial Banquet in October 797, recited an ode on Chrysanthemum flowers and he states that several poems existed before that period. Since

* By Teizo Niwa, Professor of Floriculture and Landscape Gardening, Faculty of Agriculture, Tokyo Imperial University. George Allen & Unwin, Ltd., London, 1937. Pp. vi + 56 + 4. 80 colour plates, 4 impressions of petals and 20 of leaves. Price 12s. 6d.

the plants found favour with the Emperor, the nobility—and later the common people—took up their cultivation. The Chrysanthemum was soon looked upon as the Queen of Flowers, and has been lauded in prose and poetry for the last thousand years.

Much has been written on the origin and history of the Japanese Chrysanthemums, and many authors have held that two species only, *C. sinense* (syn. *C. morifolium*) and *C. indicum*, were the progenitors of the race. Professor Niwa now propounds another theory and suggests that in addition three other species are concerned, viz., *C. boreale*, *C. japonicum* and *C. satsumense*; he points out that these also have a morphological resemblance to cultivated Chrysanthemums. To test his own theories he has cultivated over thirty thousand plants of these five species, and has found that hybridization is possible amongst four of them, and that large-flowered varieties can be developed from the single-flowered types. As a result, he believes that this race of plants has resulted from complex intercrossings helped by mutations from the wild types and that all the intermediate varieties have been lost in the interval. The author points out that—apart from his own work—there is a total absence of any scientific data on the genetics of the genus. All the five species mentioned as possible parents have either white or yellow flowers, and the question is raised as to where all the numerous colours of this hybrid race could have come from. What all writers, including Professor Niwa, appear to have overlooked is that in the white-flowered *C. sinense* there is a reddish or plum shade on the underside of the ray-florets and that this colour may well have been diffused or split up and blended with the yellows of *C. indicum*. We know that this has happened with the hybrid races of Gerberas, Primulas, and the modern Petunias of our gardens.

The first Japanese Chrysanthemums reached Europe in or about 1688, and were then cultivated in Holland, but soon died out. A number of varieties were introduced from China to France in 1789 and thence to England, where they have been largely cultivated ever since. In 1795 a plate of a red-coloured variety appeared in the Botanical Magazine, t. 327, under the name *C. indicum*.

The author figures 111 garden varieties and four of the species which he considers are the progenitors of the race; these form the subject of 80 beautiful plates in natural colours. On plate 78 the author figures a yellow and a magenta variety of semi-double form, one of a group of “edible Chrysanthemum.” The flower petals are eaten without distinction of colour and have a sweet flavour. Their use as an article of food appears to be peculiar to Japan. As a medicine, their use in China can be traced back for over a thousand years.

Nothing is said by Professor Niwa on the Japanese methods of cultivation of these plants, a subject on which all Europeans would like to have had some information, as it is well known that the Japanese excel in cultural methods.

C. P. RAFFILL.

Bulletin of the Colonial Institute of Amsterdam.*—

We have recently received the first number of this Bulletin, published by the Institute in collaboration with the Netherlands Pacific Institute. In the Foreword it is stated that "this new periodical is published with the object of creating an organ by means of which a double aim may be achieved: to lay before the world outside our own country and its dependencies, in the English language, subjects of current importance in the Netherlands Indies, and, furthermore, to inform the Dutch reading public of events and conditions in Pacific countries which deserve their attention." The first number contains an Introduction outlining the organisation of the Colonial Institute, six articles, written in excellent English, on various aspects of Netherlands colonial life and administration, and one article in Dutch. To biologists the article on "Malaria in the Netherland Indies" by Professor N. H. Swellengrebel will be of special interest. We cordially welcome the appearance of this Bulletin, which should prove a most valuable medium for making known the aims and methods of Netherlands colonial administration.

The Stapelieae.†—Less than three and a half years have elapsed since the first edition (October 1933) of White & Sloane's account of the *Stapelieae*, containing 206 pages and 236 photographic reproductions, was published. In this comparatively short time the joint authors must have been working at high pressure to complete the three magnificently illustrated volumes now in print. This work is beautifully produced and consists of 1,185 pages interspersed with 1,233 photographic reproductions and 39 coloured plates. This is more than five times the size of the original work.

The book is divided into four parts and has in addition a useful appendix. The first part introduces the *Stapelieae* and discusses their systematic position, the variation of floral structure within the group and the pollination mechanism and seed dispersal. Then follows a most valuable chapter on the distribution of the species. The separate regions are dealt with in turn, and under each regional heading the species are enumerated with their approximate localities and the edaphic and climatic factors set forth. This chapter is illustrated by excellent figures of the plants in their natural surroundings and is a most useful adjunct to the second edition. The third part consists of short chronological notes of the various workers interested in the *Stapelieae*, beginning with Justus Heurnius (1624) and ending with those of the present day. This chapter

* Published quarterly in collaboration with the Netherlands Pacific Institute, Amsterdam, Vol. 1, no. 1, November, 1937. Subscriptions, post free, per annual volume, fl. 7.50 or U.S.A. \$4.50 or 18s., payable in advance to the Editor of the Bulletin, Koloniaal Instituut, 63 Mauritskade, Amsterdam, O, Holland.

† By A. White and Prof. B. L. Sloane. Second Edition, 3 volumes. Scott E. Haselton, Abbey San Encino Press, Los Angeles, 1937. Pp. xiv + 1185 + 3 × 23. Illustrated. Price \$14, post free.

was included in the first edition, but here has been amplified to include a number of more recent workers and also field collectors.

The fourth part is a great advance on the corresponding section in the first edition and the treatment approaches that of a monographic study. A key to the genera and species has been added and, furthermore, the synonymy is fairly fully dealt with. There is, in most cases, in addition to the description, a representative figure of each species, which is of particular value when dealing with the complicated floral structure of the *Stapelieae*. A number of species and four genera have been added since the first edition, two of these latter are new (*Luckhoffia* and *Drakebrockmania*), and one genus (*Sarcophagophilus*) has been reduced. It is unfortunate that *Drakebrockmania* White et Sloane is a later homonym for which Chiovenda has substituted the name *White-Sloanea**. The appendix contains eleven sections by a number of different authors and useful information is here given on various interesting points. A map and distributional table are included in the first volume and in the second there is a coloured vegetation map of South Africa. Separate indices of plant names and persons appended to each of the three volumes complete a very fine piece of work. It is to be hoped, however, that the third edition will show more uniformity in the nature of the descriptions and the system of measurement employed, as this will facilitate the comparison of species. A fuller reference also to the literature and citations of herbarium types and material, with notes as to where the types are to be found, would enhance the value of the work and make the book indispensable to any taxonomist working on this fascinating group. E. A. BRUCE.

Bibliography of Plant Diseases†.—With the ever-increasing volume of botanical literature, most workers have felt the need for compiling some sort of card index, with or without annotations, in order to keep themselves abreast of developments in the particular branch of botany in which they are interested. Dr. Ainsworth has conceived the happy idea of putting into print such an annotated index to literature, for the benefit of British plant pathologists. He has collected together what he calls "key references" for the principal plant diseases of Great Britain, and in many cases adds notes giving a brief indication as to the scope of the paper indexed. In selecting his references Dr. Ainsworth has put accessibility among the first considerations, and while he has aimed at listing all the more important papers published in this country, his choice from foreign literature has necessarily been somewhat more arbitrary. References are given to abstracts published in the Review of Applied Mycology, so that if the original paper is not accessible an abstract at least can be found.

* Chiov. in *Malpighia* Vol. 34, 541 (1935-37).

† "The Plant Diseases of Great Britain. A Bibliography." Compiled and annotated by G. C. Ainsworth. Chapman & Hall, Ltd. 1937. Price 15/- net.

The diseases included are arranged according to crops, following the order used in the Ministry of Agriculture's Reports on the occurrence of Fungus Diseases of Crops in England and Wales 1920-1932, with the addition of a section on diseases of trees. In each crop-group the host plants are arranged alphabetically as to their generic names, in the classes Dicotyledons, Monocotyledons and Gymnosperms. The diseases are arranged under each host plant in systematic order of the causal agents, as in the List of Common Names of British Plant Diseases issued by the British Mycological Society.

On the whole, Dr. Ainsworth appears to have compiled very well. A test check of all references given to the Hyphomycetes showed only one wrong reference, and two minor slips which are probably typographical errors. As anyone with experience of indexing references knows, mistakes in such work are fatally easy, and difficult to detect in proof-reading, so that the few found cannot be considered an undue proportion. On the other hand, mistakes in the spelling of scientific names are far too numerous, and if a second edition is called for, Dr. Ainsworth would be well advised to have his names checked by a systematist.

The book is well got up and of convenient size, and will certainly be found useful as a handy work of reference to be kept on the desk of the practical pathologist. The price, however, is rather high for the type of work.

E. M. WAKEFIELD.

Par-boiled Rice Oil.—The practice of par-boiling rice has been carried out in the East on a domestic scale since early times and in later years on a large scale by rice-mills. Briefly the process consists of soaking the grain (still in the husk) in water for a time and then boiling or slightly steaming, although not sufficiently to cause cooking. Drying follows and the grain is then dehusked or milled in the ordinary way. This treatment has the effect of toughening the kernels and of facilitating their removal from the husk, thereby reducing the percentage of broken grains in milling and increasing the output of whole rice. Such rice keeps better after milling, is less likely to deteriorate on long sea voyages, and does not readily turn sour after cooking like ordinary rice. It is also claimed to require rather less cooking and therefore less fuel, a consideration with peasants in some areas. There is no appreciable change in food value compared with ordinary rice, although the taste may be altered slightly. Among many communities par-boiled rice is always preferred for food and large quantities are exported from important rice-producing countries. The great advantage to millers is that they obtain considerably less of the lower priced broken rice.

A peculiar character of par-boiled rice is the greatly increased percentage of oil in the rice bran or "meal" that is obtained from it. Rice bran or "meal" is obtained in milling during decortication, and

consists of the outer cuticle, much of the gluten layer and the "germ" or embryo. This increased oil percentage in the bran is dealt with in an interesting manner by R. Auriol* who points out that the average oil content of ordinary rice bran in French Indo-China is 13.5-14.5 per cent., whereas for par-boiled rice the figures are 24-25 per cent. The increase is attributed to the influence of pressure, temperature and steam during the par-boiling process.

The oil is described as non-drying, yellowish brown in colour with an odour which is not disagreeable and which is suggestive of rice bran. It was found to be easily saponified, even in the cold, and to bleach readily. The physical and chemical characteristics differed somewhat from those of the oil of ordinary rice bran. A notable feature about the oil was the small amount of free fatty acid present, attributed to the fact that the enzymes normally present in the seed coat are destroyed during the process of par-boiling. The resulting press-cake from oil extraction is an excellent cattle food.

F. N. HOWES.

The Seed-drift of South Africa†.—Very welcome is any addition to our knowledge of plant-dispersal, and especially so is an account of the migration by sea-currents of the seeds on South African coasts where hitherto very little on this subject has been recorded. Dr. Muir's research into this question as well as his ecological account of the strand flora of this area are of considerable importance.

As might be expected, seeds drifted from the tropics on reaching the colder climate of South Africa either fail to establish themselves or, if they do, develop only as dwarfs of the original forms, as is the case in *Xylocarpus granatum* in which it appears that the whole plant, fruit and all, is very much reduced in size.

In order to diagnose accurately the region from which sea-drifted seed is derived, it is essential to identify correctly the species or variety of the seed. This has not been easy in the cases of *Entada* and *Mucuna* so commonly found in sea-drift. Both genera require more careful and critical examination than they have received. *Mimosa scandens* L. (*Entada scandens* Benth.) certainly includes two if not three species, and *E. gigas* Fawc. et Rendle of the West Indies appears to be quite distinct from the African species, though the author assumes that the S. African drift seed belongs to it. The difficulty lies in the insufficiency of herbarium material and of due correlation of the fruits with the flowering specimens, as well as in our present meagre knowledge of the flora of Madagascar from which

* "Note Sur l'Huile de Riz Etuve." R. Auriol, Chef de la Division de Chimie, d'Agrologie et de Technologie à l'Office Indochinois du Riz. Bulletin Economique de L'Indochine 40, fas. 11. 1937. Pp. 352-3.

† By John Muir, M.D.; D.Sc. (Edin.), D.Sc. (Stell.) Union of South Africa, Department of Agriculture and Forestry. Botanical Survey Memoir No. 16. The Government Printer, Pretoria, 1937: Pp. 108. 15 plates, 6 photographs and 1 map. Price 2s. 6d.

island the drift seeds probably came. It should be possible to identify the seeds with the complete plant, and were this done as the author suggests it might revolutionize the story of the distribution. Much the same may be said of *Mucuna*, the seeds of which are not at all easy to identify.

The author mentions the dispersal of some plants by floating joints, citing *Arthrocnemum*, *Salicornia*, *Disphyma* and *Sesuvium*—plants in which the seeds have no buoyancy, yet they are widely dispersed. Information on the period of survival in the sea of such portions of sea-drifted plants is most desirable. There is a good account of the currents affecting the coast as illustrated by bottle-drift, and a map showing their directions, the most important of which are undoubtedly those passing the coast of Madagascar. Currents from S. Africa to S. America are recorded, but plant geography of these two areas does not suggest the transfer of seed alive between these countries.

This interesting and careful work contains twenty-one photographs of coast vegetation and sea-drift seeds.

H. N. RIDLEY.

Plant Ecology.*—The increasing development of plant ecology and its now generally recognized value as an introduction to biology has led to the publication of fairly numerous text-books. Apart from the desirability of correlating and co-ordinating new knowledge the need for text-books in ecology is increased by the facts that much ecological research is published in either a rather verbose or a statistical form, often without adequate summaries, and is scattered in many periodicals. The subject, moreover, has such wide contents that specialists in one branch are often glad to have general reference works available for consultation. One looks forward to the publication of a series of ecological text-books of a more specialized nature than most of those at present published in this country.

The work now under notice has much to commend it as an introduction to the synecology of the British Isles. The format is adequate, the text is very clearly written, and the illustrations (all except one of which are from photographs by Prof. E. J. Salisbury, F.R.S.) are excellent. The simple title, "Plant Ecology," is, however, too wide. Essentially the book is a brief account of ecological factors followed by an account of the plant communities of the British Isles. Little or nothing is said about the important subjects of experimental ecology and autecology. This omission may give those students to whom it is most likely to be useful a false impression both of what has been done and what remains unknown in these most important branches of ecology. The research aspect is, indeed, less emphasized than it should be in this book. Students should, from the beginning of their studies, be urged to work out

* By Hilda Drabble. Edward Arnold & Co., London, 1937. Pp. 142, plates 12. 7s. 6d. net.

problems for themselves. Since much ecological research can be undertaken without heavy expenditure, in the healthy open air, and by both individual and team efforts, it offers the teacher an easier opportunity of developing in his students a real scientific outlook than do many other subjects. The spoon-feeding of facts for memorizing by the student may have some value; it cannot, however, train the faculties of observation, consideration, and experimental initiative essential in science.

It is difficult to know how best to arrange ecological work for students. This applies both to courses and to text-books. The arrangement in Mrs. Drabble's book is orthodox in outlining the "factors" first, but the sequence of the chapters in Part II is peculiar and does not seem to be based on any logical plan. The chapters themselves are, however, for the most part, extremely useful, accurate, and up-to-date accounts of plant-communities, or groups of such. The wording is concise and unambiguous, and could scarcely be bettered for those who are preparing for examinations up to about the London B.Sc. pass (general) standard. The examination standpoint is, perhaps, emphasized by the inclusion as an appendix of 45 "Test Questions." W. B. TURRILL.

Practical Plant Breeding.*—The extending importance of genetics, from the standpoints of both pure and applied science, is reflected in the increasing number of textbooks dealing with the subject as a whole or with some special aspect of it. Since genetics is an experimental science which commenced, as far as its modern development is concerned, with Mendel's work on garden peas, it is appropriate and desirable that all who are engaged professionally in horticulture, and all those amateurs who take their gardening seriously, should be acquainted with the general principles and practice of plant breeding. Not only does such knowledge add interest to the study of plants, but it may enable the horticulturist to make valuable discoveries, either by drawing the attention of geneticists to facts of observation or by actually experimenting by fully controlled methods himself. Genetics has, however, made such enormous advances during the past three decades and has developed such an extensive terminology that the horticulturist requires either some special training or at least careful guidance in the elements of the theories and methods to avoid bewilderment on the one hand or waste of time and energy on the other. Such a guidance is provided in Mr. Lawrence's admirable book recently published in a convenient format and at a reasonable price.

Lawrence lays special stress on the technique of genetics. Very wisely he emphasizes the necessity of preliminary studies made in order to understand the methods to be used. A full and clear account of methods of protection, emasculation, pollination,

* By W. J. C. Lawrence, F.L.S. George Allen & Unwin, Ltd., London, 1937. Pp. 155, figs. 34. Price 5s. 6d. net.

recording, harvesting, labelling, and scoring is given. The theoretical laws of inheritance are explained in simple terms, and a brief outline of the mechanism of inheritance includes an account of polyploidy. The importance to the horticulturist of the different kinds of sterility is illustrated by examples. The penultimate chapter, which considers the possibilities of improving garden plants, should be particularly stimulating to ambitious gardeners. The final chapter very briefly indicates some of the recent results standing to the credit of the plant breeder.

This book can be strongly recommended to all who wish to obtain the greatest amount of pleasure and instruction out of a garden. It should also prove extensively useful to students sitting for examinations in horticulture.

W. B. TURRILL.

A Flora of Assam.*—Part 2 of Vol. 1 of this Flora, comprising the families *Linaceae* to *Moringaceae*, has now appeared. It is to be regretted that this part exhibits the same flaws pointed out in the review of Part 1 in K.B. 1935, 586. It seems that sufficient care and research have not been devoted to the work, as several species reported from Assam in available publications (the "Flora of British India" and the "Kew Bulletin") have been omitted. It is essential that all the plants falling within the scope of the work should be included in such a territorial flora. It appears that the compilation has been carried out entirely in Assam and not revised at some botanical centre where a good herbarium and reference library are available. Reference to the Sibpur and, especially, to the Kew Herbaria would have obviated most of the omissions. It is to be hoped that the compilers will be permitted to overhaul their work at least at the Sibpur Herbarium before the next part is sent to the press; they can be assured of assistance at that institution, as well as at Kew. As it is, it is to be feared that users of the book may be misled in the identification of the species not to be found in its pages. There are typographical, as well as nomenclatural errors; e.g., *Hibiscus subdrifa* for *H. Sabdariffa*, *Murraya exotica* L. for *M. paniculata* Jack, and *Chikrassia* for *Chukrasia*.

C. E. C. FISCHER.

* By U. N. Kanjilal, P. C. Kanjilal, A. Das and C. Purkayastha. Vol. I (Pt. II). Published under the authority of the Government of Assam by the Prabasi Press, Calcutta, 1937. Pp. ii+202. Price 8 Rs.

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BULLETIN OF MISCELLANEOUS INFORMATION Appendix 1937 ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1937

General

STAFF.—Mr. J. COUTTS retired from the post of Curator on August 31st, 1937 (K.B. 1937, 396). Mr. W. M. CAMPBELL, Superintendent of the Parks Department, Southend-on-Sea, was appointed to succeed him (K.B. 1937, 442).

Mr. A. R. HORWOOD, Temporary Botanist in the Herbarium, died on February 21st, 1937 (K.B. 1937, 121). Dr. E. G. S. BROWN, Assistant Lecturer, Department of Botany, University of Edinburgh, was appointed to succeed him (K.B. 1937, 356).

Mr. G. W. ROBINSON, Assistant Curator in charge of the Herbaceous Department, resigned his post to succeed Mr. W. Hales as Curator of the Physic Garden, Chelsea (K.B. 1937, 442). Mr. Robinson's place has been taken by Mr. G. H. PRESTON, Foreman in the Herbaceous Department.

Miss A. F. FITCH retired from the post of Sub-Assistant in the Herbarium on April 10th, 1937 (K.B. 1937, 273). Mr. R. A. BLAKELOCK was appointed to succeed Miss Fitch.

Mr. R. F. WILLIAMS resigned his post as Higher Grade Clerk in the Curator's Office on June 28th to take up a position in the Air Ministry. Mr. A. HEARN was promoted from the post of Clerk in the Director's Office to fill the vacancy.

Mr. C. A. GARDNER, Government Botanist, Department of Agriculture, Perth, Western Australia, commenced work at the Herbarium on March 11th as Temporary Liaison Officer for the Commonwealth of Australia (K.B. 1937, 70).

Miss H. M. L. FORBES, Botanical Assistant in the Department of Agriculture and Forestry, Union of South Africa, left Kew on December 9th, having spent 18 months in the Herbarium on transference from that department (K.B. 1936, 533).

THE DIRECTOR, Dr. T. A. SPRAGUE and SERGEANT CONSTABLE J. SEALY were awarded medals in commemoration of Their Majesties' Coronation, May 12th, 1937.

THE DIRECTOR was awarded the Veitch Memorial Medal by the Royal Horticultural Society.

OFFICIAL VISITS.—Early in January Mr. N. Y. SANDWITH spent a fortnight in the Herbaria of Paris and Geneva examining numerous

historic types of *Bignoniaceae* described by Humboldt, Bonpland and Kunth, Lamarck, and de Candolle, with a view to completing his account of this family for Professor Pulle's "Flora of Suriname."

Dr. J. HUTCHINSON and Dr. C. R. METCALFE paid a holiday visit to the Cameroons during March and April and spent a fortnight collecting on the mountain and around Amba Bay. They reached the summit on April 6th. About 170 specimens were collected, mainly of woody plants, including a large number of wood specimens for the Museums.

Mr. C. E. HUBBARD and Mr. C. A. GARDNER attended the meetings of the Fourth International Grassland Congress at Aberystwyth from July 15th-18th, and also the tour of grasslands in connexion with the Congress.

In the middle of July Mr. N. Y. SANDWITH joined an entomological expedition to British Guiana which was led by Dr. O. W. Richards of the Imperial College of Science. Seven weeks were spent in the Colony, a base being chosen at the Government rest-house at Mazaruni Station, near Bartica. From here Mr. Sandwith worked the neighbouring savannah and forest and also joined Mr. T. A. W. Davis, Assistant Conservator of Forests, in two short camping expeditions. A trip to the Kaieteur Fall was organized with the kind help of Mr. B. R. Wood, Conservator of Forests, and the party was able to spend a fortnight in this wonderful locality, making extensive collections on the savannah and in the forests of the gorge. At the beginning of October Mr. Sandwith, accompanied by Dr. J. Smart of the Department of Entomology, British Museum (Natural History), left for Tobago where he spent three weeks. He was joined for a few days by Prof. E. E. Cheesman of the Imperial College of Tropical Agriculture, Trinidad; and at the end of the month he and Dr. Smart were entertained for five days by the Imperial College and, led by Sir Geoffrey Evans or Prof. Cheesman, were able to visit several interesting localities in Trinidad. They returned to London on November 18th. Mr. Sandwith's botanical collections reached a total of about 1000 numbers, including several duplicate sets, and spirit material of 150 species.

Mr. F. BALLARD spent three weeks at Copenhagen during the months of August and September. A large number of cultivated specimens of ferns were identified critically with the assistance of Dr. Carl Christensen and a number of taxonomic problems discussed. Various African collections in the Museum and in Dr. Christensen's own herbarium were also studied. A week-end was spent on the Baltic coast of Lolland in the south of Denmark at the invitation of the Danish Botanical Society and a number of plants were collected, including seed of about forty species.

The DIRECTOR, Dr. SPRAGUE, Dr. TURRILL, Mr. MARQUAND and Miss GREEN attended the Meeting of the British Association at Nottingham, and Dr. Turrill and Miss Green read papers.

MR. E. MILNE-REDHEAD left Kew early in September to spend five months in Northern Rhodesia as a guest of Captain K. R. Paterson of Matonchi Farm, Mwinilunga. Mr. Milne-Redhead is making an intensive collection in this very interesting botanical region.

MISS H. M. L. FORBES, Botanical Assistant in the Department of Agriculture and Forestry, S. Africa, who had been working at Kew for the past 18 months, paid an official visit during October to the following herbaria on the Continent: Paris, Geneva, Zürich, Vienna and Berlin. She studied the South African material of *Tephrosia* in connexion with her revision of the South African species of this genus.

THE DIRECTOR was invited by Indian botanists to attend the 25th Annual Meeting of the Indian Science Congress to be held in Calcutta from January 2nd to January 9th, 1938, as one of the members of the delegation of the British Association. With the concurrence of the Minister of Agriculture, the invitation was accepted and the Director left England on November 26th and reached Bombay on December 17th.

The Delegation was welcomed by the Vice-Chancellor of Bombay University and other leaders of science in Bombay, and proceeded by special train to Hyderabad where they were the guests of His Exalted Highness the Nizām for three days. The Osmania University was visited and particular attention was paid to the Botanical Department and to the magnificent new University buildings in course of erection. The famous Rock Temples at Ellora and Ajunta were also visited and the journey to Calcutta was continued via Sanchi, Agra, Delhi, Dehra Dun, Benares and Darjeeling. At Agra a visit was paid to Dr. Mehta's Rust Laboratory where he demonstrated convincingly that the rust damage is due to uredospore infection distributed from the Himalaya region and from the small wheat area in the Nilghiris—the latter being particularly harmful since the uredospores are disseminated at a time when the great wheat crop of central India is in its most susceptible condition. At Delhi the various departments of the recently built Imperial Agricultural Research Institute were studied in detail and Dr. Ventakaraman demonstrated his remarkable hybrids between sugarcane and bamboo, sugarcane and Sorghum and other grasses.

The magnificent Forestry Institute at Dehra Dun was thoroughly studied together with its Herbarium and fine collection of water-colour studies of the forest flora, as well as the excellent exhibits of timber and forest products in the Museums.

The Department of Botany, Benares University, and also the Agricultural and other Departments were visited, and the Director had the pleasure of meeting the Professors of Botany, Lecturers, Assistants and Students both here and at other university centres.

When at Darjeeling, visits were paid to the interesting Lloyd Botanic Garden and some work was done in the Herbarium. From there a visit was paid to the Cinchona plantations at Mungpoo, in the charge of Mr. P. V. Osborne and Mr. L. G. Richards from Kew. Mr. H. Thomas and Mr. G. H. Fothergill also came to Mungpoo from Munsong to meet the Director. The condition of the plantations was excellent and reflected the greatest credit on the work of the present Kewites and of their long line of predecessors. During this first part of his tour in India, in addition to the four Kewites in charge of the Cinchona plantations, the Director met Mr. E. Little, who has been for so many years in charge of the Government House Gardens at Poona and Bombay, and Mr. L. F. Ruse at Delhi.

PUBLICATIONS.—Ten numbers of the "Kew Bulletin" were published during the year, and the Review of the work during 1936 was issued as an Appendix. The "List of Seeds" was published as a separate pamphlet. "The Useful Plants of West Tropical Africa" (being an Appendix to the Flora of West Tropical Africa), by J. M. Dalziel, M.D., B.Sc., F.L.S., was published in March 1937 (K.B. 1937, 398).

Part 1, Volume 10 of the "Flora of Tropical Africa (part of the family *Gramineae*)" was published on May 21st.

"Overseas Plant Products" by J. H. Holland, which is based on work done while Mr. Holland was on the staff of the Museums, was published in August.

FILM.—A short film showing all phases of the work of the establishment was completed during the year by Short Film Productions Ltd., with the co-operation of the Director and other members of the staff. The film was first shown at a private performance attended by a number of distinguished scientists and has subsequently appeared at several London and provincial theatres.

The Gardens

GENERAL.—The first quarter's rainfall of the year exceeded that ever recorded for this period during the past 200 years. This increase was maintained throughout the year and resulted in an excess rainfall of 7.25 inches over 1936. No late spring frosts occurred and new planting was facilitated by the showery weather.

Despite the increase in water storage accommodation and in the rainfall, the water consumed was 24,086,000 gallons as against 22,800,000 in 1936.

VISITORS.—The number of visitors to the Gardens in 1937 was 1,164,249; weekdays (except students' days) 569,505; students' days 75,151; Sundays 519,593—an increase of 35,589 as compared with the figures for 1936. The greatest monthly attendance was in May with 271,711, and the lowest in December with 7,814. The highest daily attendance was 64,891 on Whit Monday, May 17th, the lowest was 6 on December 13th.

ARBORETUM.—The alterations carried out to the Bamboo Garden in 1935-6 were so successful that further division and transplanting were continued during 1937.

Further plants of *Elliottia racemosa* having been presented to the Gardens, it was found necessary to transplant one or two trees in the vicinity of the single existing specimen in order to ensure the best possible growing conditions.

In the Arboretum Nursery, the old wood batten and tiffany frames used to protect small seedlings have now been replaced by a permanent brick structure. The most important work in the nursery has been the experiments carried out in collaboration with Imperial Chemical Industries, Ltd., on the use of various chemicals to stimulate root formation on cuttings (see p. 549).

Owing to old age the last of the Shire horses had to be disposed of and was replaced by a young Suffolk Punch. The five horses forming the team are now all good class Punches. Stabling accommodation has been improved by the provision of a glass roof over the doors of the loose boxes.

TEMPERATE HOUSE.—The work of re-roofing the centre portion of the house, commenced in 1936, has been continued, and further sections of the north and south sides have been completed. For this work Canadian red cedar wood has been used and already a great improvement has been noticed in the general conditions for plant growth, especially in decrease of drip and in better lighting.

In the Himalayan section the soil in the Rhododendron beds has been renewed and the plants re-arranged. Many young specimens have also been introduced in the central section where replanting is proceeding.

Lobelia Gibberoa flowered again this year, and attained a height of 38 feet 6 inches. Other plants of botanical interest to flower were a new *Mahonia*, *M. lomariifolia*; the Chinese *Rhododendron*, *R. Kyawi*; *Kigelia Moosa*; *Dolichandrone platycalyx*; the two latter Bignoniads thrived particularly well under the cool conditions of the Temperate House. *Prostanthera Sieberi*, *Doryphora Sassafras*, and the new Chilian *Cassia stipulacea* have proved valuable decorative plants. Throughout the whole of December *Luculia gratissima* has been covered with its lovely, sweet-scented flowers.

Autumn fogs, far more numerous than usual, badly affected various plants and necessitated constant washing of the glass to ensure as much light as possible.

TROPICAL DEPARTMENT.—Palm House. Continuing the work done previously the whole of the south-west wing has been overhauled. The replacement of the dark tinted glass by clear panes and the repainting of the interior has provided better overhead conditions. The opportunity was taken to renovate the heating system in this section and the stages were brought forward in order to allow the provision of special beds for climbing plants between

the walls and the staging. The whole of the York paving forming the path on the north-west side has been turned and re-faced.

House 15.—A new sectional boiler was installed, thereby improving the heating system in this house.

"T" Range.—The experiments to remedy damage to plants caused by fogs are still in progress. New filtering apparatus for this work has been recently installed (see p. 549). The exteriors of Houses 7, 8 and 9 have been painted, and new double doors fitted to House 7.

Two new rain-water storage tanks have been constructed underground in the "T" Range yard.

The three saddle boilers in the stoke-hold have been replaced by one H sectional boiler provided with an electric circulating pump.

Melon Yard.—The chief matter of interest has been the experiments conducted with neon and mercury vapour lamps to combat damage by fogs and lack of light. These experiments, carried out in House 18a, are in their early stages and further investigation will be necessary before definite conclusions can be reached (see p. 549). In this connexion it is worthy of note that the plants that have suffered most this winter through lack of light, and fogs, are *Impatiens Hookeriana*, *Ruellia macrantha*, *Reinwardtia tetragyna*, *Eranthemum Wattii*, *Crossandra undulifolia*, *Plumbago rosea*, and many *Begonia* species.

Houses 17c and 18a, b. and c. have been rebuilt in Canadian red cedar wood. In 17c alterations were made to the heating system, an overhead flow-pipe being connected to the existing return. A new rain-water tank was installed in this house.

A new greenhouse, No. 18i, has been constructed on the site of the old span-roofed frame in front of the potting shed. To increase the amount of rain-water storage two further tanks have been built.

Ferries.—On the south-west end of House 5 two new sets of double doors have been fitted.

Of special interest in the Tropical Department during the year has been the setting of two fruits on *Carica Papaya*; 12 cocoa pods on *Theobroma Cacao*; 12 fruits on the Metford lemon and 9 grapefruits on *Citrus paradisi*. The two most noteworthy plants to flower were *Hippeastrum procerum* and *Agave striata*.

HERBACEOUS DEPARTMENT.—The staging in House 25 has been replaced by the new type of concrete bench which allows a greater depth of shingle. A number of the old frames in the Propagating Yard have been replaced by new span frames, of which half are heated.

In the Rock Garden several small alterations have been made and the pathway originally leading into the Iris Garden has now been diverted to the south-west corner, allowing the construction of a new sheltered bay facing south.

Amongst the most interesting plants which flowered during 1937 were: *Colchicum triphyllum*, *Stachys villosa* var. *saxicola*, and *Fritillaria glauco-viridis* from Morocco, collected by Mr. E. K. Balls; *Nomocharis meleagrina*; *Linaria delphinoides*; *Campanula Piperi*; *Stanleya pinnata*; *Cyananthus integer*; *Salvia taraxacifolia*, collected by Mr. J. Gattefossé in the Atlas Mountains of Morocco; *Iris Barmunae*, *I. Embankiana*, *I. paradoxa*, *I. Polakii*, and *Anemone biflora* collected by Mr. A. C. Trott, Tehran, Persia.

DECORATIVE DEPARTMENT.—In the autumn the circular bed with the large flower vase and stone edging at the end of the Broad Walk nearest the pond was replaced by a bed 20 feet in diameter bordered by a grass verge 12 feet wide.

The various flower beds adjoining the north-west corner of the pond have been re-designed and some new beds constructed.

STUDENT GARDENERS.—The steady improvement in the movements of students shown in recent years has been well maintained, the number of men (20) who completed their training being five more than in 1936. All these men secured appointments on leaving the Gardens.

Outgoing Students.—Of the appointments secured at home, six were in nurseries or private gardens and the same number in parks departments; one obtained a post under the Wimbledon Borough Council as Horticultural Instructor, one entered the General Post Office (Engineering Department), one returned to Canada, one to South Africa, and one proceeded to Reading University. Three overseas appointments—the same number as last year—were to the Botanic Gardens, Singapore, the Department of Agriculture, Bermuda, and Rumania (private garden).

Incoming Students.—Twenty men were admitted for instruction and training and were recruited as follows: Parks Departments (seven); nurseries and private gardens (seven); Government House, Falkland Islands (one); Armstrong College, Newcastle-upon-Tyne (one); Royal Hospital, Chelsea (one); John Innes Horticultural Institution (one); Botanic Garden, Cambridge (one); Agricultural School, Mikveh-Israel, Palestine (one).

Under exchange arrangements nine men proceeded to botanical and horticultural establishments overseas, viz.: La Mortola, Italy; State Horticultural School, Vilvorde, Belgium; Botanic Gardens at Berlin, Göteborg, Hamburg, Munich and New York; Luxembourg Gardens, Paris, and the Department of Public Works, Pretoria, South Africa.

Ten students, one from Austria, one from University College, Dublin, one from Germany, four from Holland, one from South Africa, one from Sweden, and one from Turkey, were permitted to work in the Gardens as voluntary students for varying periods.

RAINFALL RECORD.—Rainfall recorded at the Royal Botanic Gardens, Kew, during 1937:—

		Inches.			Inches.
January	...	3.68	July	...	.77
February	...	3.95	August	...	3.01
March	...	2.85	September	...	1.81
April	...	2.10	October	...	2.39
May	...	2.27	November	...	1.42
June	...	1.82	December	...	3.61

Total 29.68 inches.

The total for 1936 was 22.43 inches.

WATERFOWL.—The following presentations of ducks have been most kindly made to the Gardens during the past year :—

10 Fulvous Tree ducks, by Mr. A. Ezra, Foxwarren Park ; 6 Black-billed tree ducks, 2 Madagascar White-eye ducks, and 2 Muscovy ducks by Monsieur J. Delacour, Clères, France ; and 5 Muscovy ducks by Mrs. Watson, Halsey Cottage, Normandy, Surrey.

Among the birds bred in the Gardens during 1937 were 5 Carolina ducks and 3 Magellan geese. Two Chinese geese, 5 Common Pochards and 2 Mallards were also reared in the duck pens. One pair of Cinnamon Teal were received in exchange from Messrs. McLean and Wormald, Norfolk.

CONTRIBUTIONS TO THE GARDENS, 1937.—The following is a summary of the items of most interest amongst the 960 separate consignments of plants, bulbs, seeds, etc., received during the year :—

Special consignments intended for the Empire Exhibit, Chelsea Show, were received from the following :—

Australia, Royal Agricultural & Horticultural Society, Adelaide ; Canada, Central Experimental Farm, Ottawa ; Ceylon, Botanic Gardens, Peradeniya ; Gambia, Department of Agriculture ; Gold Coast, Department of Agriculture ; Grenada, Colonial Secretary ; Hong Kong, Colonial Secretary ; India, The Royal Agri-Horticultural Society, Calcutta ; Kenya, Mount Elgon Nurseries, Kitale ; Nigeria, Department of Agriculture ; Nyasaland, Department of Agriculture ; St. Helena, Department of Agriculture and Forestry ; Seychelles, Department of Agriculture ; Singapore, Botanic Gardens ; Trinidad, Botanic Gardens ; Zanzibar, Department of Agriculture ; Major A. A. Dorrien-Smith, Tresco Abbey, Isles of Scilly ; Mr. Amos Perry, Enfield.

Public Institutions :—

Amani, East African Agricultural Research Station.—Seeds.

Arnold Arboretum, including the Atkins Institution.—Seeds, including *Elliottia racemosa*.

Berlin, Botanic Garden.—Seeds, fern spores, and plant of *Correa speciosa* var. *cardinalis*.

Bermuda, Department of Agriculture.—Two cases of bulbs of *Lilium Harrisii*.

British Guiana, Forest Department.—Seeds of *Strychnos toxifera*.
 British Museum (Natural History).—Seeds collected by Capt. Sherriff and Mr. Ludlow in S.E. Tibet.
 Cambridge, Botanic Garden.—Plants, seeds and cuttings.
 Canton, Sun Yatsen University.—Seeds.
 Chelsea Physic Garden, London.—Plants and seeds.
 Christchurch, New Zealand, Botanic Garden.—A collection of seeds.
 Darjeeling, India, Lloyd Botanic Garden.—Seeds of Eastern Himalayan plants.
 Dunedin, New Zealand, Botanic Garden.—Seeds.
 Edinburgh, Royal Botanic Garden.—Plants, including *Coleus*, *Darlingtonia*, *Drosera*, *Iris*, *Paeonia*, *Primula*, *Restio* spp., *Welwitschia Bainesii* Carr. and various seeds.
 Geneva, Jardin botanique.—Seeds.
 The Hague, Public Parks.—A collection of trees and shrubs.
 Hyde Park, London.—Plants, including a collection of hardy Primulas and seeds, including a collection by Colonel Bailey from Nepal.
 Hong Kong, Botanical and Forestry Department.—Plants and seeds.
 John Innes Horticultural Institution, Merton.—Plants of *Streptocarpus* sp., a collection of hybrid Calceolarias, and seeds.
 Kiel, University Botanic Garden.—A collection of plants including *Lithops*, *Pleiospilos*, *Rimaria*, *Titanopsis*, *Cotyledon*, *Echeveria* and *Pelargonium* spp.
 Kimberley, McGregor Memorial Museum.—Seeds.
 Kirstenbosch, Bolus Herbarium.—Plants, including species of *Ruschia*, *Conophytum*, *Anacampseros*, *Mesembryanthemum*, also plants of *Ophthalmophyllum Friedrichiae* and *Lapidaria Margaretae*, collected by Mr. A. F. Bayer.
 Kirstenbosch, National Botanic Gardens.—Seeds.
 Nanking, Botanic Garden, Sun Yatsen Memorial Park.—Seeds.
 New York Botanical Garden.—Plants, including a collection of succulents from Mexico and *Clematis* spp. Seeds from the Rocky Mountains Expedition.
 Nigeria, Conservator of Forests.—Seeds of *Hydnocarpus Wightianus*.
 Nigeria, Director of Agriculture.—Pods of *Theobroma*.
 North Borneo, Director of Agriculture.—Banana suckers.
 Ottawa, Central Experiment Farm.—Budwood of *Rosa* spp. bulbs of *Lilium* spp., and several consignments of seeds.
 Palermo, Orto botanico.—Offsets of *Agave* spp., and a collection of seeds.
 Panama, Canal Zone Experiment Gardens.—Cuttings of *Lonchocarpus Nicou*.
 Port Elizabeth, Parks and Town Attractions Department.—A collection of trees, orchids and succulents. Seeds of *Oldenburgia arbuscula*.

Pretoria, Division of Plant Industry.—Plants of *Streptocarpus Pole-Evansii* and several consignments of seeds.

Reading University, Botany Department.—A collection of liverworts.

St. Helena, Agricultural and Forestry Officer.—A consignment of bulbs of *Lilium longiflorum* var. *eximium*.

Somaliland, Veterinary and Agricultural Department.—A collection of *Stapelias*.

Stellenbosch, University Botanic Gardens.—Bulbs of *Haemanthus pumilis* and *Ammocharis falcata*. Seeds and corms of *Gladiolus Bolusii* and a collection of seeds.

Summerland, Canada, Dominion Experimental Farm.—A collection of native plants from the Okanagan Valley.

Swansea Parks.—Plants, cuttings and seeds.

Trinidad, Department of Agriculture.—Plants, including a collection of orchids, and seeds.

Uganda, Department of Agriculture.—Plants of *Leptaspis cochleata* and *Bulbophyllum platyrrhachis*.

Washington, U.S. Department of Agriculture.—Tubers of *Colocasia* and *Xanthosoma* spp. Several consignments of seeds, including *Regnellidium diphyllum*, *Agropyron* and *Lespedeza* spp.

Wisley, Royal Horticultural Society's Gardens.—Plants, including a collection of alpine, seeds and bulbs.

Private Donors :—

Lord Aberconway, Bodnant, Tal-y-Cafn.—Plants, cuttings and seeds, including a collection from Eastern Yunnan.

Mr. A. W. Anderson, Timaru, New Zealand.—Seeds.

Mr. G. P. Baker, Kippington, Sevenoaks.—Plants and seeds.

Messrs. Baker Bros., Texas.—A collection of plants, including *Lonicera*, *Biota*, *Cupressus* and *Lantana* spp.

Col. C. Beddington, London.—Seeds and cuttings.

Dr. R. Bevan, Henley-on-Thames.—A collection of plants.

Mr. S. Boothman, Maidenhead.—Plants and seeds.

Mr. S. W. McLeod Braggins, Bordighera, Italy.—Seeds.

Mrs. A. S. G. Brown, London.—A collection of stove and greenhouse plants.

Chandra Nursery, Sikkim, India.—Seeds.

Sir Jeremiah Colman, Gatton Park.—Plants, including a collection of orchids.

Donard Nursery Co., Newcastle, County Down.—A collection of greenhouse plants from the Empire Exhibit, Chelsea, and a collection of shrubs.

Mr. C. D. Donoghue, Ilford.—A collection of Haworthias.

Messrs. Duncan & Davies, Ltd., New Plymouth, New Zealand.—Plants and seeds.

Messrs. C. Engelmann, Ltd., Saffron Walden.—Plants and seeds.

The Forestal Land, Timber and Railways Co., Ltd., London.—Seeds collected in Argentine and Chaco by Señor T. Meyer.

- Mr. W. Arnold Forster, St. Ives.—Seeds.
- Dr. H. G. F. Fourcade, Humansdorp, Union of South Africa.—A collection of succulents.
- Mr. A. V. Giblin, Hobart, Tasmania.—Seeds.
- Mr. B. J. Gould, Sikkim.—Plants of *Rheum inopinatum*, cuttings and seeds from Sikkim and Tibet.
- Mr. S. H. Griffin, Churt.—A collection of succulents.
- Lord Hartington, London.—Seeds, including a collection from Tasmania.
- Messrs. Hillier & Sons, Winchester.—Plants, including some from the Chelsea Empire Exhibit, and a collection of shrubs.
- Mr. G. B. Hinton, Mexico.—Plants of orchids, tubers of *Dahlia* sp., and many consignments of seeds.
- Miss I. W. Hutchison, Kirkliston.—A collection of seeds from the Aleutian Islands and the Japanese Hills.
- Major L. Johnston, Hidcote Manor, Campden.—A collection of plants and cuttings, bulbs of *Nerine* and seeds.
- Mr. D. R. Keith, Stegi, Swaziland.—A collection of succulents.
- Mr. J. W. King, Kettering.—A plant of *Crataegus oxyacantha* bearing mistletoe.
- The Knap Hill Nursery, Woking.—A collection of *Sorbus* spp., Azaleas and *Nothofagus* spp.
- Mr. W. A. Knight, St. Augustine, Fla., U.S.A.—Five plants of *Elliottia racemosa*.
- Mr. C. H. Lankester, Costa Rica.—Several consignments of plants and seeds.
- Mr. B. Levy, Wankie, S. Rhodesia.—Plant of *Ceropegia* sp. and several batches of seeds.
- Miss N. Lindsay, Abingdon.—Plants and cuttings, and a collection of bulbs, corms and seeds from Persia.
- Mr. E. H. McCulloch, Mosman, New South Wales.—A case of bulbs of *Amaryllis Belladonna*.
- Mr. F. W. Millard, East Grinstead.—Seeds and plants, including a collection of alpine.
- Lord Moyne, London.—A collection of orchids.
- Major A. Pam, Broxbourne.—Seeds and plants, including *Pamianthe*, *Alstroemeria*, *Clematis*, *Genista* and *Hippeastrum* spp.
- Major P. Pechell, Odiham.—A collection of orchids.
- Dr. von Poellnitz, Oberlödla, Germany.—A collection of Haworthias and plants of *Gasteria Schweickerdiana*.
- The Prime Minister (The Right Hon. Neville Chamberlain, M.P.).—A collection of orchids.
- Mr. D. Pringle, Port Elizabeth, Union of South Africa.—A collection of Stapelias.
- Dr. W. Rama, Madagascar.—Orchids, including fine specimens of *Cymbidium rhodochilum*.
- Mr. D. M. Reid, Harrow.—Seeds of Bacuri.
- Dr. E. Reuter, Helsingfors, Finland.—Seeds.

- Mr. Lionel de Rothschild, Exbury.—Plants, cuttings and seeds of *Erica* spp.
- Messrs. L. R. Russell, Ltd., Windlesham.—Seeds of *Hevea brasiliensis* and plant of *Cryptanthus acaulis* var. *Russellii*.
- Hon. Mrs. E. F. Ryder, Beaulieu.—Plants and seeds.
- Mr. F. D. Stewart Sandeman, Kingennie, Angus.—Plants of *Primula* spp.
- Messrs. Sanders (St. Albans), Ltd.—Orchids.
- Dr. R. Seligman, Wimbledon.—Plants and seeds.
- Mr. H. B. Sharpe, Rumuruti, Kenya Colony.—Plants, cuttings and seeds of *Caralluma*, *Stapelia* and *Edithcolea* spp.
- Mr. W. G. Sheldon, Oxted.—A collection of seeds from Addis Ababa.
- Messrs. W. C. Slocock, Woking.—Plants of *Rhododendron* and a collection of elm, apple, cherry, rose and lime stocks.
- Mrs. Smith, Leigh-on-Sea.—A collection of orchids.
- Major F. C. Stern, Goring-by-Sea.—Plants and cuttings.
- Mr. H. L. Stinson, Seattle, Washington.—Seeds of *Delphinium*, *Mertensia* and *Aquilegia* spp.
- Mr. A. J. Symons, Jersey, Channel Islands.—A collection of *Achimenes*.
- Mr. A. C. Trott, Tehran.—Bulbs and seeds from Iran.
- Messrs. Robert Tucker & Co., London.—A collection of bulbs from Bermuda.
- Mr. T. G. Tutin, Cambridge.—Seeds.
- Mr. F. A. Weinthal, Roseville, New South Wales.—A collection of orchids; seeds of *Drosera peltata*.
- Mr. J. W. Wyatt, London.—Seeds from New Zealand and the Tasmanian Alps.

DISTRIBUTION OF PLANTS AND SEEDS.—At the commencement of the year, the annual distribution of seeds resulted in 199 separate consignments being despatched, comprising 5703 packets of herbaceous plants and 4120 packets of trees and shrubs. The aggregate shows a decrease of 155 packets as compared with the year 1936.

Special distributions were made of the following seeds:—*Agave lechuguilla*, *Leucadendron argenteum*, *Lespedeza* sp., *Ammocharis longifolia*, *Elliottia racemosa*, *Primula* spp., *Rheum* sp., and *Rhododendron* spp. The following seeds harvested at Kew were distributed, in addition to those mentioned above:—*Aesculus indica*, *A. californica*, and *Davidia Vilmoriniana*.

Recipients of plants, etc., included the following:—

Institutions:—

Amsterdam, Botanic Garden.—Plant of *Clivia nobilis*.

Amani, East African Agricultural Research Station.—Aquatics.

Armstrong College, Newcastle-upon-Tyne.—Economic plants.

The Benmore Trustees, Dunoon, Argyll.—A collection of Mexican oaks.

- Berlin, Botanic Garden.—Hardy trees and shrubs.
- Burnley, Parks Department.—Hardy trees and shrubs.
- British Legion Poppy Factory, Richmond.—A collection comprising 124 trees and shrubs.
- Bristol University, Department of Botany.—A collection of ferns.
- Cambridge, Botanic Garden.—Alpine, herbaceous and stove plants including *Brownea Crawfordii*; tubers of *Nymphaea* spp.
- Cambridge, King's College.—*Camellia Sasanqua*.
- Cap D'Antibes, Centre de Recherches Agronomiques de Provence.—*Funkia* spp.
- Cape Town, Public Works Department.—Seeds of *Aesculus* spp.
- Chelsea Physic Garden, London.—A collection of greenhouse and herbaceous plants.
- Chicago, University of Chicago.—A collection of cycads.
- Civil Service Sports Ground, Chiswick.—A collection of hardy climbers.
- Edinburgh, Royal Botanic Garden.—Plants and seeds.
- Exeter, University College of the South West.—Economic plants.
- Feltham, H.M. Borstal Institution.—A collection of trees.
- Giza, Egypt, Ministry of Agriculture.—A Wardian case of mangoes transhipped from Trinidad, B.W.I.
- Glasnevin, Botanic Gardens.—Seeds of *Exacum macranthum*.
- Green Cross Society, London.—Seeds of British native plants.
- The Hague, Public Parks.—Seeds, plants and grafts of hardy trees and shrubs.
- Hakgala Botanic Garden, Ceylon.—A collection of *Nymphaea* spp.
- Hampton Court.—Plants and seeds of *Rosa* spp.
- Hyde Park, London.—Trees and shrubs.
- Ibadan, Nigeria, Department of Agriculture.—Wardian cases of cacao seedlings grown from Trinidad seeds.
- John Innes Horticultural Institution, Merton.—Plants, including *Tolmiea Menziesii*.
- Kew, Ministry of Labour.—A collection of hardy shrubs.
- Khartoum, Government Gardens.—A Wardian case of decorative plants.
- Kiel, Botanic Garden.—*Conophytum* spp.
- Kirstenbosch, National Botanic Garden.—Plants, including *Passiflora racemosa*, *Beloperone guttata*.
- Kornik, Poland, Gardens and Arboretum.—Plants and grafts of hardy trees and shrubs.
- McGill University, Montreal.—A collection of seeds of trees, shrubs and herbaceous plants.
- Ministry of Labour Social Service Association (for the village of Escombe, Co. Durham).—A large collection of trees and shrubs.
- Moscow, Botanic Garden.—Seeds of *Victoria regia*.
- Moshi, Tanganyika Territory, Coffee Experimental Station.—A Wardian case of decorative and economic plants.

Napier, New Zealand, Parks Department.—A collection of plants and seeds of trees and shrubs for replanting the earthquake zone of the town of Napier.

New York Botanical Garden.—Seeds of *Victoria regia* and plants of *Begonia* spp.

Nottingham, University College.—A collection of trees, shrubs and herbaceous plants.

Ravenscourt Park, London, W.6.—Herbaceous plants.

Riga, Botanic Garden.—A collection of *Begonia* spp.

Rostov-on-Don, Botanic Garden.—Seeds of *Victoria regia*.

St. Helena, Agricultural and Forestry Office.—Seeds of *Agave lechuguilla* and a collection of decorative plants.

St. Mary's Hospital (Inoculation Department), London.—Plants of *Humea elegans*.

Saratov State University.—52 packets of grass seeds.

Seychelles, Department of Agriculture.—Seed and tubers of *Nymphaea* spp.

Soldiers', Sailors' and Airmen's Families Association.—A collection of Dahlias.

Swansea Parks Department.—A large collection of greenhouse and hardy plants.

Trinidad, B.W.I., Department of Agriculture.—Plants of the small-sized Brazil nut (*Bertholletia excelsa*).

Trinidad, B.W.I., Imperial College of Tropical Agriculture.—Banana suckers.

Rijks Arboretum, Wageningen, Holland.—*Crataegus* spp.

U.S. Department of Agriculture, Washington.—Plants and seeds, including *Rosa ecae*, hardy trees and shrubs.

Windsor Great Park.—A collection, comprising 390 hardy trees and shrubs.

Wisley, Royal Horticultural Society's Gardens.—A collection of alpine including *Primula Rockii*.

Zoological Society of London.—Trees, shrubs and stove plants.

Private Recipients :—

The Rt. Hon. Lord Aberconway, Bodnant.—Seeds and plants of *Alstroemeria* spp.

Mr. F. R. S. Balfour, Dawyck.—A collection of orchids, miscellaneous trees and shrubs.

Dr. R. Bevan, Henley-on-Thames.—Alpines.

Viscount Bledisloe, Lydney Park, Glos.—*Aesculus indica*.

Mr. E. A. Bowles, Waltham Cross.—Herbaceous plants.

Brookside Nurseries, Ltd., Oxford.—Grafts and cuttings of hardy trees and shrubs.

Messrs. Burkwood & Skipwith Ltd., Kingston-on-Thames.—Seeds and plants, including *Olearia Gunniana*.

M. J. Cardon, Meirebeke-lez-Gand, Belgium.—A collection of stove plants and orchids.

- The Rt. Hon. Sir Austen Chamberlain, K.G.—*Magnolia Soulangeana*.
- Mr. C. J. Chamberlain, Chicago.—Cycads.
- Mr. W. S. Chamberlain, Hampton-on-Thames.—A small collection of plants including *Phyllocactus Cooperi*.
- Col. Stephenson Clarke, Cuckfield.—*Quercus incana*.
- Hon. Mrs. P. Spender-Clay, Dormans.—Bulbs of *Lilium* spp.
- Sir Jeremiah Colman, Gatton Park.—Orchids, including *Cymbidium rhodochilum*, and *Nepenthes* spp.
- Mr. W. Corbett, Swanley.—Seeds of *Asparagus* spp.
- Lady Currie, Aldbourne.—*Pelargonium* spp.
- Dartington Hall, Totnes.—Plants and seeds.
- Lord Decies, Falfield, Glos.—A collection of Mexican oaks.
- M. J. Delacour, Clères, S.I., France.—*Aristolochia ridicula* and *A. Sturtevantii*.
- Donard Nursery Co., Newcastle, Co. Down.—A collection of *Magnolia* spp.
- Mr. S. Duruz, Wallington.—Alpines, including *Primula Forrestii*.
- Lady Thiselton-Dyer, Bere Alston.—Hardy plants.
- Mr. C. Eley, East Bergholt.—Plant of *Camellia saluenensis*.
- Mr. J. Etherington, Purley.—Seeds of hardy trees and shrubs.
- Mr. W. Arnold Forster, St. Ives.—Plants of *Camellia hongkongensis*.
- Mr. Howard Fyfe, New York.—Hardy bamboos.
- Messrs. R. Gill & Sons, Falmouth.—Collection of trees, shrubs and greenhouse plants.
- Commander F. Gilliland, Londonderry.—A collection of trees and shrubs.
- Mr. A. R. Goodwin, Kidderminster.—Seeds and plants of *Primula* spp.
- Mr. B. J. Gould, Sikkim.—A collection of seeds of alpine.
- Col. C. H. Grey, Hocker Edge, Cranbrook.—Seeds and plants, including *Pratia begoniifolia*.
- Mrs. M. Grieve, Chalfont St. Peter.—Plants of wild chicory.
- Sir Cecil Hanbury, La Mortola.—A collection of *Quercus* spp.
- Messrs. Hillier & Sons, Winchester.—Plants, grafts and cuttings of hardy trees and shrubs.
- Messrs. Geo. Jackman & Son, Woking.—Grafts and cuttings of hardy trees and shrubs.
- Major L. Johnston, Hidcote Manor, Campden.—Greenhouse plants, and trees and shrubs.
- Knap Hill Nursery, Ltd., Woking.—Plants, seeds and cuttings of hardy trees and shrubs.
- Mr. C. H. Lankester, Costa Rica.—Succulents and orchids.
- Messrs. Laxton Bros. (Bedford) Ltd.—Grafts of *Cerasus Sargentii* and hardy trees and shrubs.
- Mr. H. O. Levy, Jamaica.—A collection of *Dendrobium* spp.
- Miss N. Lindsay, Abingdon.—Plants and seeds.
- Mr. R. H. Macaulay, Kirnan, Argyll.—Plants and seeds of alpine.

- Lt.-Col. L. C. R. Messel, Haywards Heath.—Collection of *Ceanothus* spp.
- Major A. Pam, Broxbourne.—Plants, including *Hippeastrum reticulatum*, and *Haemanthus Katherinae*.
- Miss L. F. Pesel, Winchester.—A consignment of 4750 cuttings of hardy shrubs, for the use of the Roads Beautifying Association.
- The Rt. Hon. the Earl of Powis, Welshpool.—A plant of *Vitex Agnus-castus*.
- Mr. L. F. Randolph, Ithaca, N.Y.—Collection of *Iris*.
- Dr. J. E. H. Roberts, London.—Alpines.
- Mr. Lionel de Rothschild, Exbury.—A collection comprising 78 packets of seeds from Sikkim.
- Messrs. L. R. Russell, Ltd., Windlesham.—Stove plants, including *Nepenthes* spp.
- Messrs. B. Ruys, Ltd., Dedemsvaant, Holland.—Alpines.
- The Hon. Mrs. E. F. Ryder, Beaulieu.—Miscellaneous plants and bulbs.
- Messrs. Sanders (St. Albans), Ltd.—Orchids.
- Mrs. D. E. Saunders, Farnborough, Kent.—Plants and seeds of alpine.
- Messrs. W. C. Slocock, Ltd., Woking.—Plants and cuttings of hardy trees and shrubs.
- Major A. A. Dorrien-Smith, Tresco.—Seed of *Kniphofia Rogersii*.
- The Rt. Hon. the Earl of Stair, Stranraer.—A collection of Mexican oaks.
- Major F. C. Stern, Goring-by-Sea.—Seeds of *Kniphofia Rogersii*, and hardy trees and shrubs.
- Mr. A. J. Symons, Jersey, Channel Islands.—A collection of *Achimenes*.
- Prof. F. Tobler, Dresden.—Plants of *Alocasia* spp., and *Aphelandra Fascinator*.
- Messrs. R. Wallace & Co., Tunbridge Wells.—Bulbs of *Lilium Brownii* var. *Colchesteri*.
- Major H. F. Ward, Nairobi.—A collection of plants, including *Pavonia rosea* and *Scutellaria costaricana*.
- Capt. G. Warre, Roquebrune, A.M., France.—Plants, including *Correa* spp., and *Jasminum rex*.
- Messrs. John Waterer, Son and Crisp, Ltd., Bagshot.—Plants and grafts of hardy trees and shrubs.
- Dr. J. Cromar Watt, Aberdeen.—*Camellia japonica* var. *magnoliiflora*.
- Mr. A. G. Weeks, Limpsfield.—Seeds of alpine.
- Mr. F. A. Weinthal, Roseville, N.S.W.—Plants of *Cattleya* and *Cymbidium* hybrids.
- Mr. E. Whitney, Groombridge.—Plants of *Puya alpestris*.

Bedgebury Pinetum

Tree growth was, on the whole, very satisfactory during the year, but there are a few species and varieties of several genera that are still stunted.

The beneficial results of cleaning out ditches and drains during and since the laying out of the Pinetum were very noticeable in the early part of the year, for despite a very heavy rainfall throughout the winter and spring, areas that were water-logged ten years ago remained reasonably dry. However, the heavy rainfall made the ground cold, and although there was no prolonged period of frost in winter, almost all kinds of trees were late in breaking into growth, and fortunately there were no injuries from late spring frosts. A sunny summer and early autumn resulted in well-ripened wood, which was uninjured by rather severe frosts that occurred between the middle of November and late December.

The rainfall for the year amounted to 40.69 inches, January being the wettest month with 6.78 inches and July the driest month with .87 inch. The highest fall on one day was 2.06 inches on August 13th. The coldest night during the early part of the year was March 10th, when 22 and 21 degrees of frost were registered on the ground in low, wet places. In the screen 13 degrees of frost were registered on the same night. In autumn 21 degrees of frost were recorded on the ground in two low, wet places, and 12 degrees of frost were registered in the screen on the same night. As in past years, the difference in temperature between low, wet places and higher ground a few hundred yards away was very marked. The difference is usually 4 or 5 degrees but it is sometimes as much as 8 degrees.

During the summer the Forestry Commission decided that a belt of trees about five chains wide, surrounding the greater part of the Pinetum, should be subjected to special management in order to preserve the amenities of the place and provide the necessary shelter. The Office of Crown Lands has transferred to the Pinetum an area of a little over three acres of open land adjoining the Pinetum for planting with decorative trees, on which a further trial may be made with species and varieties that have not grown well in their original positions. A similar area of coppice adjoining the open ground has been transferred to the Forestry Commission in order that both amenities and shelter may be insured in a position where woodland merges into open fields.

The practice adopted two or three years ago of planting broad-leaved trees among the conifers, to aid in the improvement of the soil, has been continued, the necessary trees being sent from Kew. In 1935 two additional acres of land were added to the Pinetum, whereon to plant a good many unnamed Chinese species of *Abies* and *Picea*, and certain trees that had not grown well where they were first planted. The young trees were badly crippled by frost soon after they were planted and they grew very little in 1936.

However, they became well established during the favourable summer of 1937 and many have formed good leading shoots.

There has been the usual trouble through honey fungus which killed fifteen trees, and there has been some trouble with green aphids on spruce.

The Museums

As in former years, routine work connected with correspondence took up a considerable amount of time. The unsettled conditions in Spain and China caused enquiries to be made regarding the medicinal species of the genus *Ephedra*, and the possibility of the cultivation on a commercial scale in this country of tarragon (*Artemisia Dracunculus* L.), has been brought forward on several occasions. The now popular game of darts has brought several enquiries for information as to suitable fibres for the making of the better types of dart-board, and samples and information have been supplied to manufacturers.

A number of lavenders grown in this country for the distillation of essential oil were received for examination and all were found to be forms of the hybrid *Lavandula latifolia* Vill. \times *L. officinalis* Chaix. A sample of "peppermint" from the Argentine, with a high oil-content, proved to be a species of *Mintostachys*.

Several collections of plant-remains from Egyptian excavations have been received for identification (see also Jodrell Laboratory report), some in a remarkably good state of preservation. Notable examples were some castor-oil seeds (circa 3500 B.C.) on which the characteristic mottling of the seed coat was still clearly visible; this is especially remarkable in view of the soft nature of the seed.

A collection of fruits and pieces of wood recovered from the gravels of the Ankobra River, Gold Coast, probably of late pleistocene to recent age, were found to be largely the same as existing forms.

Many additions to the newly-formed herbarium of economic plants were made during the year, including a collection of adventive weeds by Mr. R. L. Smith, Cardiff. It is felt that plant-products exhibited in the Museums, and particularly timbers, should have corresponding herbarium specimens as a check on the determinations. Such are now being asked for from correspondents desiring exchanges and the results so far have been encouraging, particularly from the United States of America.

The work of checking and adding to the arboretum herbarium has been continued, the arrangement of the species of several genera being changed from alphabetical to taxonomic in order to facilitate determinations. A large number of additions have been made during the year, mainly from the gardens, and specimens have been contributed by Mr. A. B. Jackson.

Owing to excessive crowding many of the bottles of small seeds and the small timber specimens are being extracted from the cases of No. 1 Museum and stored elsewhere as reference collections. The seeds have been arranged systematically in the office of the

Museum and the small timbers will be displayed similarly on shelves in the hall of Museum No. 4. The relabelling of exhibits in No. 1 Museum has been continued and two floors are now almost completed.

Some exhibits of special interest to the general public have been shown in No 3 Museum, which is nearest the main gate and attracts most visitors. All the smoking pipes and the walking sticks scattered throughout the systematic collections in No. 1 Museum are now being shown separately. Notable additions to No. 3 Museum are two wood pictures kindly lent by the makers, Messrs. Richard Graefe Ltd., of High Wycombe. One, representing a view of the City of Benares on the Ganges, a duplicate of that supplied for the decoration of the ship of that name, measures 9½ ft. by 6½ ft. The number of veneers used in this picture is 25, only a few being artificially coloured, and the effect is very remarkable.

Through the kindness of two firms, Messrs. Heal and Son, Tottenham Court Road, and Paul and Marjorie Abbatt, Wimpole Street, sets of children's toys, made mostly of plain wood, were lent for exhibition during the Christmas holiday period.

Members of the Museum staff continue to serve on the Consultative Committees of the Imperial Institute and the Crude Drugs Sub-committee of the British Pharmacopoeia Commission.

PUBLICATIONS.—*Tephrosia macropoda* as a possible Insecticidal Plant (K.B. 1937, 510).

On Elm Seedlings (Quart. Journ. Forestry, 31, No. 4 : 1937).

The Accurate Definition of Leaf Shapes by Rectangular Coordinates (Ann. Bot., N.S., 1, 4 : 1937).

PRESENTATIONS TO MUSEUMS :—Paul and Marjorie Abbatt Ltd., London : educational wooden toys, on loan.

Beacon Brushes, Ltd., Bucks. : fibres used for brush-making.

Botanic Garden, Braunschweig : 21 packets of seeds.

Mr. E. G. Bryant, S. Africa : fruits of *Harpagophytum procumbens* and *Acacia Giraffae*.

Mr. S. H. Chantry, Kew : wood specimen.

Chiswick Products, Ltd. : sample of purified " uricuri " wax.

Mr. F. H. Chittenden, R.H.S. : fruits of lemon-orange graft hybrid.

Major V. B. D. Cooper, London : dried stems and prepared fibre of *Asclepias incarnata*.

Mr. H. A. Dade, Kew : pod of an uncommon type of *Amelonado* cacao.

Mr. W. Dallimore, Tunbridge Wells : timber specimen.

Dr. Fourcade, S. Africa : everlasting flowers.

Mr. A. J. Gibson, London : sample of " yeast flowers."

Mr. J. S. L. Gilmour, Kew : photographs of Nigerian industries.

Messrs. R. Graefe, Ltd., High Wycombe : pictures made of wood, on loan.

- Messrs. Hall and Co., Transvaal : specimens of *Nephelium Litchi*.
 Messrs. Heal and Son, London : wooden toys, on loan.
 Mr. N. B. Helmsing, Hull : wood specimens.
 Prof. F. Kirchheimer, Germany : fossil seed.
 Mr. Leo R. Kische, U.S.A. : 16 hand specimens of N. American timbers.
 Dr. R. Melville, Kew : wood specimens.
 Dr. J. G. Parker, London : root of *Dioscorea rhipogonoides* Oliv., and leather and fabric tanned and dyed with it.
 Mr. C. H. Robinson, California : 36 timber samples and herbarium material.
 Mr. H. M. Sharpington, London : wood specimen.
 Starch-Free Foods, Ltd., London : sample of "Profarin" flour.
 Miss H. M. Smith, London : native musical instrument from the Cameroons, on loan.
 Mr. R. L. Smith, Cardiff : 30 specimens of adventive weeds.
 Messrs. Thomas Tait and Sons, Ltd., Scotland : tin of Esparto dust.
 Mr. P. Topham, Nyasaland : pods of *Swartzia madagascariensis*.
 Messrs. Tullis Russell and Co., Scotland : sample of Esparto wax.
 Mr. A. Wade, Penwortham : reeds used as laths in an old ceiling.
 The Wellcome Foundation, Ltd., London : replica of a medal, struck in honour of Dr. F. B. Power.
 Mr. W. Wright, Waltham Abbey : sample of Indian "Sabai" grass.

The Jodrell Laboratory

The routine work, as usual, consisted in identifying miscellaneous botanical material by anatomical means. Most of the items examined were wood specimens from such varied sources as Brazil, San Salvador, India, New Zealand, Australia, and various parts of Africa. Apart from modern specimens, wood used in the construction of antique furniture in The Wallace Collection was examined, and also some from the tomb of Tut-ankhamun. An unusual item was a sample known as "peacock wood" which exhibited quite a pleasing "figure," but was found to consist of small fragments of walnut (*Juglans regia*) held together by glue. A few medicinal plants were also examined, and a fibre, stated to be used for making guncotton in Peru, consisted of hairs from one of the *Cactaceae*.

A considerable number of new microscopical slides has been incorporated in the collection, including sections of wood collected by the Assistant Keeper during a visit to the Cameroons with Dr. J. Hutchinson (see p. 530).

Work on the morphology and life history of *Ranunculus Ficaria* has been continued, and an account will shortly appear in the "Annals of Botany." It is hoped before long to complete a further article on this subject in collaboration with Mr. E. M. Marsden-Jones.

The laboratory has to an increasing extent become a centre for the scientific investigation of horticultural problems in collaboration with the gardens staff. Thus the work on the adverse effect of atmospheric pollution on greenhouse plants, which is especially noticeable in foggy weather, has been continued. This has confirmed the view, to which allusion was made in last year's report, that the sulphur acids present in the atmosphere, operating under suitable conditions of temperature and humidity, constitute the chief source of trouble. Attempts are being made to reduce the damage by preventing polluted air from entering the houses and also by supplying the plants with purified air. Experiments with artificial lighting are also being carried out on a larger scale than previously in an attempt to improve the health and capacity to produce flowers of plants which bloom in the dull or foggy winter months. Considerable assistance with this work has been provided by H.M. Office of Works.

Another subject being investigated in collaboration with the gardens staff is the use of chemicals, which, by their hormone-like action, stimulate root formation on cuttings of various plants. Considerable assistance on the chemical side has been provided by members of the staff of the Imperial Chemical Industries Agricultural Research Station at Jealott's Hill. This subject has recently commanded attention in so many quarters that a meeting of botanists, nurserymen and chemical manufacturers to discuss the matter was held at Kew in November by invitation of the Director (see *Nature*, 141, 88: 1938, and *Gard. Chron.* ser. 3, 103, 93: 1938).

Manurial treatments for cacti are also being studied.

Dr. A. Clark and Mr. J. Pryde demonstrated the presence of prussic acid in the caeca of rats which had been fed on maize cobs, suggesting that this was produced by the decomposition of some substance present in the maize. This discovery is particularly important in connexion with the disease known as pellagra which is exhibited especially by people who live almost exclusively on a maize diet. It is hoped that an account of this work will shortly be published. Mr. J. Pryde also continued his researches on the nature of the chemical substances present in a number of different kinds of wood from South Africa. Mr. D. P. Watson completed his work on the structure and germination of some leguminous seeds, and was awarded an M.Sc. degree at London University for a thesis on this subject. Mr. J. Bausch completed an investigation of the anatomy of *Eucryphia* in relation to the disputed taxonomic position of the genus, and also assisted with some of the special investigations which were in progress during his visit. Other visitors were Miss W. M. Curtis (morphology and anatomy of *Taraxacum*), Mr. H. Muyser (structure of conifer needles) and Mr. J. E. Senaratna (anatomy of *Leptaspis*).

DRAWING AND PHOTOGRAPHY.—A number of photographs of Kew type specimens have been made for other institutions and several consignments of borrowed specimens have been photographed for our own collection.

Many living plants have been either photographed or drawn for the Kew records and a certain amount of work has been done for "Hooker's *Icones Plantarum*."

Drawings, graphs, maps and photographs have been prepared for various publications including the Kew Bulletin, the Journal of the Linnean Society, the Journal of the Royal Meteorological Society and the Annals of Botany.

A series of photographs illustrating the progress of the research work on the effects of atmospheric pollution has been started and will be supplemented from time to time.

Mrs. Manley, formerly Miss D. A. Chaytor (London), made the drawings for her "Taxonomic Study of the Genus *Lavandula*." Dr. D. P. Watson (Toronto) prepared a series of drawings for his work on seeds. A number of photomicrographs of seed coats was prepared on his behalf.

Other visitors to the Studio included Prof. Boyd Thomson (Toronto), Mr. J. Bausch (Holland), and Mr. W. J. Stokoe from Messrs. Frederick Warne & Co., Ltd., London.

The Herbarium

EUROPE, NORTH AFRICA, AND ORIENT.

10,596 numbers have been received for incorporation in this department of the Herbarium. This figure includes 6827 numbers received for identification or verification, but does not include single specimens or small parcels sent for determination. 10,970 sheets have been mounted and laid in.

Additions to the collections from the British Isles have been made by members of the Kew staff from Gloucestershire, Norfolk, Suffolk, Lincolnshire, Wiltshire, Westmorland, and Scotland. Miscellaneous British collections were received from Mr. G. O. Allen, Miss M. E. Edmonds, Mr. D. B. Fanshawe, Mr. G. T. Fraser, Mr. P. M. Hall, Mr. J. E. Lousley, Mr. F. K. Makins, Mr. H. S. Redgrove, Rev. H. J. Riddelsdell, Mr. H. N. Ridley, Mrs. C. I. Sandwith, Mr. A. L. Still, Mr. E. C. Wallace and Mr. C. H. Wright.

Mr. H. J. Goddard has continued his presentation of specimens from John Ralfs's Herbarium. The Botanical Society and Exchange Club of the British Isles presented a set of the plants received from its members.

The following important collections of plants (totalling over 2250 numbers) from the Balkan Peninsula have been presented during 1937 :—The first set of the large collection made by Mr. E. K. Balls and Dr. W. B. Gourlay in northern Greece, Thessaly, Epirus, and South Macedonia. As this is the only complete set it is particularly valuable and is being worked out in detail. It is hoped

to publish a full account of it at a later date. Other presentations include :—Crete (Mr. P. H. Davis); Greece (Miss D. Lowe); Albania (Mrs. R. V. Pennington and Dr. P. L. Giuseppi); N. Macedonia (a particularly fine and valuable collection made by the Rev. and Mrs. H. P. Thompson); Corfu, Yugoslavia, etc. (Capt. A. H. Batten Poole, received through Dr. H. Bancroft); and Serbia (Miss K. M. Sitens).

A collection from Crete and Greece was purchased from Dr. F. Lemperg, a set of 500 specimens from the Dobruja from Mr. Al. Cretzoiu, and a well-prepared collection from Macedonia, Thessaly, etc., from Mr. O. Grebenschikoff. A set of over 900 specimens of Aegean plants was purchased from Dr. K. Rechinger. This makes a most welcome addition to the representation at Kew of plants from the Aegean Islands, which are still very little known botanically. It may be hoped that Dr. Rechinger's valuable results will stimulate other collectors to visit the Aegean area.

Specimens from Norway were presented by Mrs. Seys and by the Oslo University Botanical Museum. A valuable set of 114 Scandinavian *Carices* was received from Dr. C. G. Alm and a set of 54 numbers of *Celsia* spp. was presented by the Lund Botanical Museum. Material from Spitzbergen was received from Mr. A. M. Acock and from Mr. C. G. Dobbs.

Other European collections presented were: Austria (Mr. C. E. C. Fischer, Mr. E. Hodgkin, and Mr. J. W. Wyatt); Germany (Mr. D. B. Fanshawe and Mr. J. W. Wyatt); France and Switzerland (Dr. R. W. Butcher and Mrs. C. Q. Knowles); Czechoslovakia (Karlovy University, Prague, Cent. 4, Flora Cechoslovenica Exsiccata, and Masaryk University, Brno, Cent. 12, Flora exsiccata Reipublicae Bohemicae Slovenicae); and Poland (Cracow University, Series 2, Cent. 3, Plantae Poloniae exsiccatae).

From southern Europe specimens were presented by Miss B. Schafer (Spain and Portugal), Mr. P. Aellen (Corsica), and Mr. W. T. Stearn (Italy).

Oriental plants were received from Cyprus (Miss C. E. Godman, Lady Loch, Mrs. F. N. Stagg, and the Department of Agriculture, Nicosia); Iran (Miss M. Daly, Miss N. Lindsay, and Mr. A. C. Trott); Caucasus (Dr. Tad. Wisniewski); and Arabia (Mr. R. C. Maxwell Darling and Mrs. H. R. P. Dickson). Particular attention should be called to the very useful material being received from Cyprus, especially that collected by Mr. A. Syngrossides of the Department of Agriculture. It is hoped to make at Kew as complete a representation as possible of the interesting flora of this island, and further collections would be welcomed. Special mention should also be made of the welcome gift of Caucasian specimens from Dr. Tad. Wisniewski. The rich flora of the Caucasus is very imperfectly represented in western European herbaria, and many gaps remain to be filled.

Sets of plants from Palestine and Transjordan were purchased from Vester and Co., and sets 7, 8 and 9 of seeds of agricultural and weed plants, with corresponding herbarium specimens, were purchased from the Hamburgisches Staatsinstitut für angewandte Botanik.

From North Africa Prof. R. Maire presented specimens from Algeria and Mr. A. W. Trethewy valuable collections from Morocco. Dr. M. Grabham sent a small collection from Madeira.

Prof. P. E. Newberry presented a fine set of wild olives accompanied by a series of photographs of plants in their natural habitats.

Miss D. A. Chaytor (now Mrs. Manley) completed her work on the wild lavenders and, in the early part of the year, kindly assisted in naming several collections.

Miss W. M. Curtis continued her research on the anatomy and development of British and other *Taraxaca*, utilizing the material being grown in the Herbarium Experimental Ground.

Mr. R. A. Blakelock began work as a Sub-assistant in June, 1937, performing duties previously undertaken by the late Mr. A. R. Horwood.

Publications.—Additions to the Flora of Cyprus: III (K.B. 1937, 341).

A Taxonomic Study of the genus *Lavandula* (Journ. Linn. Soc. Bot. **51**, 153: 1937).

Verbascum pannosum Vis. (Gard. Chron. **101**, 135: 1937).

On the Flora of the Nearer East: XVIII (K.B. 1937, 79).

A Contribution to the Botany of Athos Peninsula (K.B. 1937, 197).

The Black Knapweed and its use in phenology (Quart. Journ. R. Meteor. Soc. **63**, 79: 1937).

Plants used in the Balkan Peninsula in place of Tea (Proc. Linn. Soc. 149th Session, 67: 1937).

A New Species of *Sempervivum* (Gard. Chron. **102**, 302, fig. 132: 1937).

Fritillaries (Roy. Hort. Soc. Lily Year-Book, **6**, 30; 1937).

The Genus *Fritillaria* in the Balkan Peninsula and Asia Minor (Journ. Roy. Hort. Soc. **62**, 329: 1937).

ASIA.

Some 6000 new sheets were incorporated in the Herbarium, but there is still a considerable accumulation of arrears, mainly from the Malay Archipelago, remaining to be dealt with.

INDO-MALAYA.—Professor E. Barnes sent a further 100 specimens of flowering plants and 120 cryptogams from South India. Several species proved to be new. His collections are particularly useful owing to their excellent condition, the full notes and the fact that some are accompanied by material preserved in formalin.

Mr. B. J. Gould, I.C.S., presented a large collection of plants from Tibet made by Mr. F. Spencer Chapman during their official

mission to Lhasa. The examination of the specimens has not progressed far, but one new species of *Androsace* has already been described for publication and figuring in the "Icones Plantarum."

The naming of the large collection presented by Dr. N. L. Bor, I.F.S., mainly obtained in the Naga Hills of Assam, has been completed with the exception of some 20-30 specimens which are being further investigated, as they appear to be new. Among those identified were a number which represent new records for India or at least for the Province of Assam.

The Natural History Museum of Paris presented over 200 Indo-Chinese specimens and the Burma Forest Department nearly 250 specimens. As a large percentage of the latter were found in the little-known Wa States in south-east Burma they are of special interest.

Smaller contributions came from the Arnold Arboretum (Siamese); the Assam Forest Department; the Agricultural Department, Ceylon; the Chandra Nurseries (Tibetan); the Forest Botanist, Dehra Dun; and the Royal Botanic Gardens, Calcutta.

Further consignments (totalling roughly 600 numbers) were received from the Forest Department, British North Borneo. The determination of the material received to the end of 1935 has now been suspended in order to deal with the Oxford University's Sarawak (1932) collection. Work on this was commenced in the summer, and the unexpectedly high proportion of novelties to be described from families not already dealt with by specialists, while enhancing the value of the collection, has retarded progress. The scientific importance of this collection will, it is felt, justify the publication of a complete enumeration of the phanerogams: this is now in course of preparation at Kew.

Nearly 500 duplicates of Malayan plants were presented by the Botanical Gardens, Buitenzorg, and about 300 by the Botanic Gardens, Singapore.

Dr. K. P. Biswas, Curator of the Herbarium of the Royal Botanic Gardens Calcutta, was deputed on a year's study leave, most of which was spent at the Kew Herbarium. Advantage was taken of his presence to discuss questions of common interest to the Kew and Calcutta institutions, especially with regard to certain authenticated specimens desired for the Calcutta Herbarium; as a consequence a selection of duplicates was extracted from the Herbarium and sent to India.

Miss M. M. Whiting has again volunteered her services and accomplished very useful work in sorting and rearranging the Indo-Malayan collections. Mr. H. B. G. Garrett, late of the Siam Forest Service, worked voluntarily on similar lines, and carried out very valuable service in laying-in many hundreds of sheets.

CHINA.—Work on the taxonomy of Chinese lilies was continued, special attention being paid to the species from Yunnan and

Szechuan, for which the whole of Franchet's types were received on loan from Paris. Amongst the results obtained, the identity of the much misunderstood *L. nepalense* was established, and the morphological range and geographical distribution of *L. ochraceum* was revised and extended. A full record of this work was published in Part 5 of the Supplement to Elwes's Monograph of the genus *Lilium*.

Of collections received during the year the largest was a gift from the Nanking University of 1037 specimens, and another from the Lingnan University, Canton, of 963 specimens. Other contributions included *Orchidaceae* and *Liliaceae* from the Arnold Arboretum and the Sun Yatsen University, and *Carices* from the Imperial Universities of Hokkaido and Kyoto. Numerous sheets, both of types and unnamed material, were sent on loan to specialists, notably to Dr. Handel-Mazzetti, and the latter were returned greatly increased in value by the addition of critical determinations. Messrs. T. Tang and F. T. Wang of Peiping University continued their researches throughout the year on the *Liliaceae* and *Orchidaceae* of China, and were ever ready to assist the staff through their knowledge of Chinese script or geography.

Publications.—Contributions to the Flora of Siam: Additamenta XLI to XLIV (K.B. 1937, 26, 71, 87 and 371).

Pterocarpus Draco L. (K.B. 1937, 63 and 477).

The Gentians of China (K.B. 1937, 134).

New plants from Tibet and Sikkim (K.B. 1937, 94).

Contributions to the Gentian Flora of Southern Tibet, N.E. Burma and Bhutan (K.B. 1937, 180).

Notes on *Lilium ochraceum* Franchet and *L. nepalense* D. Don (K.B. 1937, 191).

The Genus *Neurocalyx* in Borneo (K.B. 1937, 281).

Imperfectly known Species Misplaced in the Flora of the Malay Peninsula, by C. F. Symington (K.B. 1937, 318).

Notes on *Carex*: I (K.B. 1937, 353).

Contributions to the Flora of Burma: XIII (K.B. 1937, 436).

Types of Chinese Lilies (R.H.S. Lily Year-book 1937, 96).

The first part (with plates) of "An account of the genus *Dioscorea* in the East," by Sir D. Prain and I. H. Burkill, much of the work on which was carried out at Kew by Mr. Burkill, was published towards the end of the year in the Annals of the Royal Botanic Gardens, Calcutta.

AFRICA.

During the latter part of the year Mr. E. Milne-Redhead, the Botanist in charge of the African department, was absent on special leave in Northern Rhodesia, where he is making an intensive botanical collection. The staff of the department was brought up to normal strength in June by the appointment of Dr. E. G. S. Brown to the post of Temporary Botanist in succession to the late Mr. A. R. Horwood (K.B. 1937, 121 and 356).

In addition to the very heavy routine work of naming collections, a considerable amount of time was occupied in replying to enquiries by research workers regarding the classification and nomenclature of African plants. Revisions of the genus *Cordyla* (*Leguminosae*) and of various *Stapelieae* were undertaken. Papers contributed by botanists not on the African staff included a further contribution to our knowledge of the arborescent *Senecios* of the East African mountains, an investigation into the morphological characters of the genus *Rhynchoscalyx* with a view to establishing its taxonomic position, and studies on the genus *Brownanthus* (*Mesembryanthemaceae*). An account of Mr. J. B. Gillett's Somaliland collection is being prepared for publication to accompany his paper on the vegetation of the region.

WEST TROPICAL AFRICA.—A collection of 123 specimens from the Gambia, made by Mr. L. H. Saunders, forms a useful contribution to our knowledge of this relatively little known area. Further collections have been made in Sierra Leone by Mr. F. C. Deighton, and a set of these has been received from the Department of Agriculture. The Gold Coast Forestry and Agricultural Departments have presented specimens collected by various officers. Nigerian specimens have been presented by the late Revd. Ivan D. Hepburn; the Imperial Forestry Institute, Oxford; and by Mr. R. J. Newberry.

CAMEROONS AND CONGO.—About 750 named duplicates, including many species previously unrepresented at Kew, have been received in exchange from the Botanic Gardens, Brussels, and a smaller number from the Natural History Museum, Paris. A number of specimens were also received from Mr. D. R. Rosevear.

NORTH-EAST TROPICAL AFRICA.—Our collections from Eritrea and Italian Somaliland have been enriched by the receipt, as an exchange, of 245 specimens from the Istituto Botanico della R. Università, Bologna. An interesting set of about 50 numbers of Sudan plants was received from Mr. J. G. Myers, and other specimens from this area were contributed by Messrs. H. B. Johnston and E. Evans Pritchard. A small collection of poisonous plants of British Somaliland was presented by Mr. E. F. Peck of the Veterinary Service.

EAST TROPICAL AFRICA.—Interesting collections still continue to come in from this area, materially increasing our knowledge of the flora.

Uganda.—The technical excellence of the specimens received from the Departments of Agriculture and Forestry, maintains the previous high standard. Over 750 numbers were received from the former Department and about 250 from the latter.

Kenya.—Nearly 200 specimens were presented by the Forestry Department, and smaller numbers were received from the Veterinary Research Laboratory and the Department of Agriculture. Among gifts from private collectors were 91 specimens from Mrs.

D. R. Tweedie, and smaller numbers were received from Mr. A. W. Haylett, Mrs. Chater Jack, Lady Muriel Jex Blake, and Miss D. C. Mainwaring.

Tanganyika.—Kew is again indebted to the East African Agricultural Research Station, Amani, for fine collections from this area amounting to nearly 1500 specimens, besides a small number from Kenya. Over 900 numbers were received from the Department of Tsetse Research, collected by Mr. B. D. Burt. These included a large number from Nyasaland and N. Rhodesia. Special thanks are due to Mr. Burt for an extremely fine set of *Brachystegia*, including about 150 different gatherings, which will prove invaluable in the study of that difficult genus.

SOUTH TROPICAL AFRICA.—Nearly 300 numbers were presented by the Nyasaland Department of Agriculture, and 87 numbers by the Department of Agriculture, N. Rhodesia, collected by Mr. C. G. Trapnell. The last gatherings of the late Mr. F. Eyles in S. Rhodesia, numbering about 200, and including much material preserved in liquid, were the finest ever received from that able and prolific collector. Sr. A. de F. Gomes e Sousa has contributed a further 200 interesting specimens from Portuguese East Africa. Duplicates of Southern Rhodesian plants were also received from the Transvaal Museum.

SOUTH AFRICA.—During the course of the year about 1000 specimens from South Africa were named and 1010 specimens were incorporated in the Herbarium.

The Bolus Herbarium, Dr. H. G. Fourcade and Captain T. M. Salter presented fine named collections of Cape plants. Mr. F. R. Long of Port Elizabeth and Dr. J. S. Henkel of Maritzburg, Natal, forwarded a few specimens for naming. The Transvaal Museum, Pretoria, sent in 55 specimens for identification, of which 15 numbers were received as a donation. The Natal Herbarium, Durban, forwarded 311 numbers of Natal plants for naming and retention by the Kew Herbarium. Several smaller collections of plants (about 200 specimens), were sent in for naming, partly for retention, partly for return, by the McGregor Museum, Kimberley. As usual, the National Herbarium, Pretoria, contributed a large number of specimens, over 1350 in all, partly named, partly for critical determination, including 100 sheets of species of S. African *Aloë*. The bulk of these specimens was retained by the Herbarium. A small but interesting collection from the Barberton area was received for naming from the Empire Cotton Growing Corporation.

The Stellenbosch University, the McGregor Museum, the Bolus Herbarium and the National Herbarium most generously assisted the researches on *Ammocharis* undertaken by officers of the African section, by forwarding photographs and illustrations, dried, spirit and living material of the genus.

The drawings and photographs of *Mesembryanthemeae* in the collection of the late Dr. N. E. Brown have been incorporated in the general collection of drawings.

Mr. A. A. Bullock is continuing his researches on the *Mesembryanthemeae*, especially the genera *Trichodiadema* Schwantes and *Glottiphyllum* Haw.

Mr. B. L. Burt and the Director in collaboration have almost completed their investigations of the genus *Scabiosa* in tropical and southern Africa.

Miss H. Forbes of the Natal Herbarium has returned to South Africa after having spent a period of 18 months in the study of the South African material of the genus *Tephrosia* Pers. in all the more important European herbaria.

Mr. E. Milne-Redhead and Dr. H. G. Schweickerdt have completed their researches on the genus *Ammocharis* Herb. and the manuscript is being prepared for the press.

Dr. Schweickerdt is continuing his studies on South African *Gramineae* (see p. 562), and during the course of the year several of his papers, among those mentioned below, were published.

MASCARENE ISLANDS.—About 50 specimens were received from the Department of Agriculture, Seychelles.

Publications.—Tropical African Plants: XV–XVII (K.B. 1937, 54, 333 and 411).

Note on a species of *Neorautanenia*, by E. P. Phillips (K.B. 1937, 86).

The Arborescent *Senecios* of the Cherangani Range (K.B. 1937, 361).

The Taxonomic position of *Rhynchocalyx* (K.B. 1937, 392).

The Genus *Octolobus* Welw. (K.B. 1937, 394).

Notes on the Flora of Southern Africa, VII, by I. C. Verdoorn and H. G. Schweickerdt (K.B. 1937, 445).

New trees and shrubs from Tropical Africa: V, by H. Dunkley (K.B. 1937, 466).

Notes on *Carex*: II (K.B. 1937, 472).

Notes on *Mesembryanthemeae*: I, The Genus *Brownanthus* Schwantes (K.B. 1937, 492).

A New Species of *Streptocarpus* (K.B. 1937, 514).

The Genus *Cordyla* Loureiro (Fedde, Repert. 41, 227: 1937).

A New Synonym (Cactus Journal, Dec. 1937, 31).

Newly Recorded Genera of S. African Flowering Plants (S. Afr. Journ. Science, 1936, 438).

An Account of the S.A. Species of *Tribulus* Tourn. ex Linn. (*Bothalia*, 3, pt. 2: 1937).

A Note on the S.A. Species of *Ximenia* Linn. (*Bothalia*, l.c.).

A Revision of the S.A. Species of *Helictotrichon* Bess. ex Schult. (*Bothalia*, l.c.).

A Revision of the S.A. Species of *Brachylaena*, R. Br., by E. P. Phillips and H. G. Schweickerdt (*Bothalia*, l.c.).

An Enumeration of Plants collected in the Northern Transvaal, by A. A. Obermeijer, H. G. Schweickerdt and I. C. Verdoorn (Bothalia, l.c.).

AMERICA.

During the year 10,105 sheets have been mounted, and about 6550 incorporated. For four months, from July to November, during the absence of the Botanist in charge of the American section of the Herbarium (Mr. N. Y. Sandwith) on a collecting expedition, the work was carried on single-handed by Mr. A. A. Bullock, who was at the same time responsible for the identification of South African succulents. For this reason there has been considerable delay in dealing with new collections, particularly with those of Mr. G. B. Hinton, who continues to send remarkably fine collections of Mexican specimens. His total numbers now exceed 10,500, and he sent 150 additional gatherings of *Bursera* which required special attention.

Items of work completed during the year included the account of the *Bignoniaceae* for Pulle's "Flora of Suriname," and the identification of a very large collection of *Strychnos* made in Amazonia by Mr. B. A. Krukoff. Among collections which were named were those of Mr. C. W. Thornton from Alaska, Mrs. A. L. Blake from Patagonia, and a small consignment from the Forest Department of British Guiana; while the whole of the Steinbach collection from Bolivia, purchased during the years 1927-1929, was finally incorporated.

The following collections were also received:—

N. AMERICA.—*Presented*: By the University of California, Berkeley (Alaska and California); California Academy of Sciences, San Francisco (California); Bentham-Moxon Trustees (Yukon, Alaska and Columbia); Mr. C. C. Cholmondeley (Labrador); Botanical Museum, Copenhagen (Greenland); Farlow Herbarium, Cambridge, Mass. (Cent. 8, Reliquiae Farlowianae); Gray Herbarium (Cent. 7 Plantae Exsiccatae Grayanae, and plants from Virginia); Mr. J. C. Greene (Canada and U.S.A.); Mr. F. J. Herman (Michigan and Indiana); Dr. H. H. Hume (*Cyperaceae* of Florida); Imperial Forestry Institute, Oxford (N. America); Mr. T. R. G. Moir (Newfoundland); Dr. and Mrs. H. N. Moldenke (American *Cyperaceae*); New York Botanical Garden (Florida); Mr. H. D. Ripley (critical S. Californian plants); Lord Rossmore (Greenland); Mr. C. W. Thornton (Alaska). *Purchased*: From Dr. Aven Nelson (Arizona).

CENTRAL AMERICA.—*Presented*: By Prof. C. Conzatti (Mexico); Mr. W. H. Fellowes (Mexico). *Purchased*: From Mr. F. Lyle Wynd (Mexico); Mr. Howard Scott Gentry (the Rio Mayo District of Mexico); Prof. T. G. Yuncker (British Honduras); Dr. A. F. Skutch (Costa Rica).

WEST INDIES.—*Presented*: By Lord Moyne (Eastern Swan Island). *Purchased*: From Rijks Museum, Stockholm (Haiti and San Domingo, coll. Dr. E. L. Ekman).

EAST TROPICAL S. AMERICA.—*Presented*: By Department of Agriculture, British Guiana (Brazil, coll. Glaziou and others); Botanical Museum, Utrecht (Surinam), and Mr. C. H. Lankester (Matto Grosso). *Purchased*: From University of California, Berkeley (Brazil and Peru, coll. Mrs. Ynes Mexia); Mr. B. A. Krukoff (Brazil).

WEST TROPICAL S. AMERICA.—*Presented*: By Dr. J. Soukup (Peru); Miss Dora B. Stafford (Peru); United States National Museum, Washington (Panama Zone). *Purchased*: From Mr. R. J. Seibert (Panama Zone); United States National Museum, Washington (Peru, Coll. G. Klug); Mr. T. O. Weigel (Buchtien, Herbarium Bolivianum Cent. 9 & 10, part).

TEMPERATE S. AMERICA.—*Presented*: By Dr. Manuel Barros (Argentine *Carices*); Mrs. M. E. Blake (Argentine); Mr. T. Meyer (Chaco region); Museo Nacional de la Plata (*Carices* and *Compositae* of Chile).

Publications:—Contributions to the Flora of Tropical America XXIX-XXXIII;

The Genus *Periptera* (K.B. 1937, 75);

New species and records from British Guiana (K.B. 1937, 100);
Plantae Hintonianae: III-V (K.B. 1937, 291, 447 and 502).

On the Identification of *Rhus filicina* Sessé et Moc. ex DC, (K.B. 1937, 440).

Notes on Tropical American Bignoniaceae (Rec. Trav. Bot. Néerl. 34, 205: 1937).

Identification of certain Candolleian types of South American Bignoniaceae (Candollea, 7, 244: 1937).

AUSTRALIA AND NEW GUINEA.

Good progress was made in getting the large amount of outstanding material mounted and incorporated into the Herbarium, and the greater part of the Australian material has now been dealt with. There still remains, however, a considerable accumulation of New Guinea specimens. Mr. C. E. Hubbard's Queensland plants (excluding *Gramineae*) have now all been named and incorporated with the exception of the *Cyperaceae*, and a large number of duplicates are ready for distribution. Dr. F. A. Rodway continued to send interesting collections, mainly from southern New South Wales, containing many rare or little-known species. Other collections were received from Mr. J. M. Black (Adelaide); Mr. E. Ashby (mostly Western Australia); Mr. A. V. Giblin (Tasmania); the National Herbarium, Sydney; and the North Queensland Naturalists' Club. Capt. J. McComish sent an interesting series of

plants from Lord Howe Island containing good additional material of many of the rare endemic species.

From March onwards Mr. C. A. Gardner, Government Botanist of Western Australia, has been working in the Herbarium and has been engaged on his projected "Flora of Western Australia." As a result many of the genera in the Herbarium have been thoroughly revised and the determinations have been brought up to date. Mr. Gardner has presented (on behalf of his Department) over 1100 duplicates of his own and other collections, including more than 300 grasses. These contain material of many of his newly described species and numerous other rare or local plants and constitute a very valuable addition to our Western Australian collections.

Dr. R. T. Patton of Melbourne University has also spent a great deal of time in the Herbarium studying the genus *Eucalyptus*, particularly the Eastern Australian species. His notes on many of the sheets will greatly enhance the value of the Kew collection of this most difficult genus. He has also kindly helped in the determination of critical material of *Eucalyptus* sent in for naming.

In the earlier part of the year Mr. J. Bausch of Rotterdam carried out a revision of the remarkable family *Eucryphiaceae*, of which several species are Australian.

Little active work has been done on New Guinea plants, but Miss B. Blackwood has sent over 300 specimens from the Territory of New Guinea, both from the mainland and the island of New Britain, while small collections have been presented by the New York Botanical Garden and the Department of Agriculture, New Guinea.

NEW ZEALAND.

Little work was carried out on the flora of New Zealand apart from replying to enquiries and determining specimens received for identification. Further consignments of interesting plants were received from Dr. H. H. Allan.

OCEANIA.

A number of minor questions were dealt with during the year. The Bernice P. Bishop Museum, Honolulu, presented a large collection of duplicates from various parts of Oceania, and a small set of Samoan plants was purchased from Dr. K. Rechinger. Work was continued on the genus *Ficus*, material being received from Dr. A. Guillaumin, Paris (New Hebrides), the Botanic Gardens, Brisbane (Solomon Islands) and other sources. The study of the Samoan species is now practically completed and an account of the Fijian species is being prepared. A good deal of critical comparative work has also been carried out on species from other island groups and from the neighbouring region of New Guinea. There is a considerable accumulation of specimens from this area, in the Store,

awaiting mounting, but it is hoped that the bulk of these will be dealt with during 1938.

Publications :—*Ficus* in A. C. Smith's "Fijian Plant Studies" (B. P. Bishop Museum, Bull. 141, 49).

ORCHIDACEAE.

Collections from all over the world, numbering well over 1000 gatherings, were named in the course of routine work. These included many living plants from the Gardens, in connexion with the preparation of the new edition of the Orchid Handlist.

Research has been continued on the orchids of Africa and of Burma and Siam. The genera *Rhipidoglossum* and *Ansellia* have been revised, while work towards a general monograph of *Habenaria* has been much aided by the loan of nearly 150 specimens from the Stockholm Herbarium. Mr. G. Le Testu of Caen, France, sent on loan a large collection of African orchids (mostly from the Gabon and Wrangi-Shari), for determination. He has also presented duplicates of many numbers. This very fine collection contains many remarkable and hitherto unknown or little-known species. Since the publication of the "Flora of West Tropical Africa" very good material in spirit of many of the Gold Coast species has been received from Messrs. J. K. Cox and G. S. Cansdale. Mr. Cox also brought over a large selection of living plants in excellent condition, many of which have flowered and, so far as is known, are the first records of these species in cultivation. Several new records for West Africa have already been made. A small but valuable collection of Cyprus orchids (mostly with corresponding spirit material) was received from Mr. A. Syngrossides, several of which belonged to rare and little-known species of *Ophrys*. Further similar material would be welcomed from this region, especially of the genus *Ophrys* which contains many critical Eastern Mediterranean forms. Messrs. T. Tang and F. T. Wang concluded the main part of their work at Kew on the orchids of China and Japan. As a result the determination of much of the material of adjacent countries has been brought into line with the most recent research.

Publications.—African Orchids: IX (K.B. 1937, 457).

A Review of the Genus *Rhipidoglossum* (Blumea, Suppl. I, 78).

Orchidaceae in Norlindh and Weimarck, Beiträge zur Kenntnis der Flora von Sud-Rhodesia: V (Bot. Notiser, 1937, 182).

GRAMINEAE.

In addition to the usual routine work of rearranging genera, naming and laying-in specimens, reports on economic grasses for a variety of purposes have been prepared, whilst the nomenclature for several British, New South Wales and Indian lists of grasses has been checked. Owing to the absence of a special preparer for grasses, only a comparatively small number (650) has been mounted and added to the Herbarium. The number of specimens named

(3010) excludes British, common European grasses and small collections of less than ten gatherings. In order to determine this large quantity of material, it has been necessary to curtail the amount of time spent on research and especially that required for the preparation of the next part of the "Flora of Tropical Africa." A number of large and important collections received during the past few years still await determination. In connexion with the exchange of duplicates, over 1950 sheets have been distributed to 16 different herbaria.

Dr. H. G. Schweickerdt has continued his studies of South African grasses. His revision of the South African species of *Helictotrichon* was published in *Bothalia*, 3, pt. 2 (1937), whilst notes and descriptions of other grasses will appear shortly in Fedde's Repertorium. He hopes to complete his account of the species of *Aristida* in South Africa after an examination of specimens in the principal European herbaria and a study of certain species in the field. Mr. C. A. Gardner has collaborated in describing new genera and species of grasses from Western Australia.

Amongst visitors, Miss J. Vickery of the National Herbarium, Sydney, commenced work towards the end of the year and intends to spend several months studying Australian grasses, in particular those from New South Wales. Mr. J. N. Whittet of the New South Wales Department of Agriculture spent a few days investigating grasses suitable for cultivation in eastern Australia. Mr. J. E. Senaratna, Assistant in Systematic Botany at Peradeniya, who is engaged in a revision and comprehensive study of the genera *Leptaspis* and *Pharus*, expects to spend 2 years in England and to work largely at Kew. In connexion with his studies, a valuable series of specimens of *Leptaspis cochleata* (living, spirit, and dried) has been received from Mr. Eggeling and Mr. Chandler of Uganda and from the East African Research Institute, Amani, Tanganyika Territory.

The collections received during the past year contained many valuable additions to the Herbarium. As in the last ten years, those from tropical Africa have been most numerous. They have included specimens of many species which were not represented when the first four parts of the "Flora of Tropical Africa" were published. Most general collections contain a certain number of grasses, but a considerable number entirely or mainly composed of these plants have also been received. The more important are listed below.

America:—United States Department of Agriculture (Newfoundland, United States, Brazil, Surinam, including several co-types, and a valuable set of species of *Mesosetum*); Professor P. Weatherwax (United States, Guatemala); Miss T. C. W. Greene (Canada); Dr. D. Hooper (St. Vincent); Universidad Nacional de la Plata (Argentina); Professor L. R. Parodi (Argentina, including co-types of new species); Welsh Plant Breeding Station,

Aberystwyth (Falkland Islands). *Africa*:—Departments of Agriculture, Uganda, Kenya, Nyasaland, Northern Rhodesia, Sierra Leone and Gambia; Mr. H. B. Johnston (Uganda, Sudan, Belgian Congo); East African Agricultural Research Station, Amani (Tanganyika); National Herbarium, Pretoria (South Africa); McGregor Museum, Kimberley (South Africa); Dr. R. E. Vaughan (Mauritius). *Asia*:—United States Department of Agriculture (Sumatra, China); Dr. N. L. Bor (Assam); Economic Botanist, Bengal (specimens of *Oryza sativa* var. *plena*). *Australasia*:—University of Melbourne (Central Australia, Victoria); Professor J. B. Cleland (South and Central Australia); Mr. R. A. Black (Victoria and New South Wales); National Herbarium, Sydney (New South Wales); Department of Agriculture, Perth (Western Australia); Mr. S. T. Blake (Queensland, including an extensive series of specimens of *Eragrostis* spp.). *Europe*:—Academy of Sciences, Leningrad (Russia, including recently described species); a valuable collection of intergeneric and interspecific hybrid grasses and their parents, raised and presented by Dr. T. J. Jenkin, Welsh Plant Breeding Station, Aberystwyth.

Publications.—Flora of Tropical Africa, vol. 10, part I.

Notes on African Grasses: XXI (K.B. 1937, 63).

The Races of Sorghum, by I. H. Burkill (K.B. 1937, 112).

Sand-binding Grasses in the Falkland Islands (K.B. 1937, 274).

Hooker's Icones Plantarum (tt. 3331, 3336-38, 3341).

PTERIDOPHYTA.

The preparation of the new edition of the "Handlist of Ferns in cultivation at Kew" has been continued throughout the year, and it is hoped that it will be possible to publish it in 1938. In this connexion valuable help has been afforded by Dr. Carl Christensen of Copenhagen who was able to assist in the naming of a large number of unnamed and unlocalised material from the Ferneries. Few collections were received during the year. About 50 Japanese specimens were presented by Dr. Tagawa, and nearly 100 specimens from Honduras collected by Messrs. Yuncker, Dawson and Youse. The latter were purchased and formed part of a general collection from the area.

Dr. K. Biswas (p. 553) completed an account of the fern flora of Burma which he had begun at the Calcutta Herbarium.

During the year 800 sheets were incorporated, while large numbers still remain sorted into genera and arranged in special cabinets.

Publications.—Notes on Ferns and Fern Allies: I (K.B. 1937, 346).

BRYOPHYTA AND CHAROPHYTA.

In addition to material received from the British Isles, collections of Mosses have been received for identification from Southern India, collected by Professor E. Barnes, and from Tristan

da Cunha, collected by Dr. R. A. Dyer during an expedition sent out from Pretoria. Specimens of *Chara* and *Nitella* from various parts of the world have been named, and, as in former years, Mr. G. O. Allen has very kindly co-operated in the work of identification. He has, moreover, presented to the Herbarium 55 microscopic slides of specimens of this group, which form a valuable addition to the slide collection.

THALLOPHYTA.

FUNGI.—Accessions to the mycological collections in 1937 included an interesting collection of 61 specimens illustrating Dr. Hedgcock's paper on blue-staining wood fungi. These were presented by the United States Department of Agriculture. Dr. L. Haumann sent specimens illustrating his work on *Penicilliosis*, and Dr. Boedijn presented named Javan fungi, chiefly *Basidiomycetes*. 200 specimens in continuation of Sydow's *Mycotheca Germanica* were purchased during the year, and 100 *Reliquiae Farlowianae* were received in continuation of exchange.

Among the larger collections sent for determination were the whole of the unnamed *Polyporaceae* from the Dehra Dun herbarium (received through the Imperial Mycological Institute), a large collection of American *Thelephoraceae* made by Mr. W. Bridge Cooke, and Uganda microfungi from Mr. C. G. Hansford. The Kew Herbarium now possesses a fine collection of *Meliolineae* made by Mr. Hansford in Uganda, including most of the types described by him in a recent paper.

During September, October and November practically the whole working day was devoted to the naming of British Agarics, the sendings of which, by many correspondents, were abnormally heavy.

Miscellaneous enquiries received during the year ranged from advice on plant diseases, dry rot, etc., to information as to certain fermentation processes and recommendations as to mycological books. An unusual case of fungus poisoning, due to *Inocybe Patouillardii*, was recorded, causing one death and the serious illness of three other persons. Though it is very unlike *Psalliota* in appearance the fungus was apparently eaten in error for the common mushroom. The species was probably unusually common in the south of England during the past summer, for at the end of June it was received for identification from three different localities within a fortnight.

As usual, routine work has also included assistance given to research workers by the loan of specimens or of slides, and advice in problems of nomenclature.

Publications.—A stem-canker disease of Gardenias, by W. Buddin and E. M. Wakefield (*Gard. Chron.* 101, 226-227, April 3rd, 1937).

ALGAE AND LICHENS.—Work on the marine algal flora of South Africa has been continued. A considerable number of queries relating to the identity of algae and lichens have come from research workers in the British Isles and elsewhere, and more than the usual number of requests for information as to the treatment of lawns and playing-fields infested with *Nostoc* have been received.

An interesting addition to the algal herbarium was a collection of 140 North American marine and fresh-water algae mainly collected by the late Dr. M. A. Howe, and presented by the New York Botanical Garden. Dr. W. R. Taylor spent several weeks in the Herbarium mainly in connexion with his study of the seaweeds of the Galapagos Islands.

A further 200 specimens, being fascicles 4-7 of *Lichenes Fenniae Exsiccati*, have been acquired as an exchange from the Botaniska Museum, Helsingfors. Smaller collections of lichens presented were received from Portuguese East Africa, Rhodesia, Uganda and South America. A number of lichens were again sent on loan to Dr. K. Redinger at Vienna.

SPIRIT COLLECTION.

The most important event during the year has been the rearrangement of the collections, the separate spirit chamber containing now only orchids, the other families having been moved to 16 steel cabinets housed in the cellar under Wing B. Here there is ample room for expansion and the addition of new cabinets. 763 bottles were added during the year, a considerable increase over last year's accessions. This was partly due to accumulations connected with the rearrangement, but also reflects the increasing use made of this method of preservation. Material of many West African orchids has been received during the year, while Mr. N. Y. Sandwith brought back about 150 gatherings in spirit made during his visit to British Guiana and the West Indies. Interesting material of many species of *Utricularia* is included among this. Spirit specimens of African *Utriculariae* and of *Podostemaceae* were also received from Mr. A. S. Thomas, who collected them in the Imatong Mountains of southern Sudan.

Representatives of 17 more genera of *Orchidaceae* were added during the year, making a total of 275 genera now contained in the collection. The preparation of the Orchid Handlist will be considerably facilitated by the very complete collection of spirit material made from the plants in the Gardens during the last seven years. Material of succulent plants growing in the Gardens (mostly *Cactaceae*, *Mesembryanthemum* (sensu lato) and *Stapelieae*), was collected along the lines suggested in the last report.

EXPERIMENTAL AND TRANSPLANT WORK.

Genetical research was continued at the Potterne Biological Station and at Kew on *Silene*, *Centaurea*, *Ranunculus*, and *Saxifraga*.

A considerable part of the experimental work with *Silene* involved foreign, and especially Alpine, material, selfing and inter-crossing various stocks, and crossing the same plants with British and other material of *S. vulgaris* and *S. maritima*. In *Centaurea* the first batch of F_3 families was scored and crosses were made to re-investigate the variation known as "*longiflora*." Mr. E. M. Marsden-Jones is continuing research at Potterne on *Anagallis* (with Prof. F. E. Weiss), on *Solanum Dulcamara*, and on *Epilobium*. Investigation of the apomicts and variations of *Taraxacum* was continued at Kew. A large number of species of plants of known wild origin from the Balkan Peninsula was studied at various stages of development from abundant living material. Especially valuable material of several important genera, including *Campanula*, *Dianthus*, and *Verbascum*, was obtained for the Herbarium.

The Transplant Experiments of the British Ecological Society at Potterne have completed the tenth year of their existence. The fourth (biennial) report has been published and the fifth prepared for press. A summary of the ten years' researches has also been prepared for publication.

Publications.—Fourth Report of the Transplant Experiments of the British Ecological Society at Potterne, Wiltshire (Journ. Ecol. 25, 189 : 1937).

Researches on *Silene maritima* and *S. vulgaris*: XVII-XX (K.B. 1937, 45, 310, 432, 481).

SEED COLLECTION.

The growth of this valuable and much used collection necessitated the provision of an additional cabinet. The four cabinets have been reconstructed and made into a convenient uniform set placed on the second floor of Wing A. The large accumulations of new specimens have been incorporated and the whole collection spaced out and the drawers re-labelled. The simplicity of arrangement and the ease with which the specimens may be consulted have proved of great assistance to visiting botanists who, together with members of the staff, have made considerable use of the collection.

SUMMARY.

The routine work, apart from naming, accomplished during 1937 may be summarised as follows:—

Mounted	46,500 (approx.)*
Incorporated	41,800 (approx.)*
Duplicates distributed	12,440
Specimens received on loan	8414
Specimens sent on loan	8165
Specimens presented or purchased	44,066

* Not including lower cryptograms.

FUMIGATION OF SPECIMENS.

Since the fumigation of the Stores in 1936 (see K.B. Appendix 1936, 572) it was considered advisable to adopt a more efficient method of gas-poisoning specimens than by using carbon bisulphide. This method, which had been used for many years, had several serious drawbacks and was doubtfully efficacious. Accordingly, an apparatus was installed for subjecting the specimens to a high concentration of hydrogen cyanide gas, a more detailed description of which will be given in an early number of the Kew Bulletin.

The apparatus was ready for regular use in October, and several thousand specimens, both mounted and unmounted, were dealt with before the end of the year. It is now a rule that all specimens must pass through the fumigation chamber before being brought into the Herbarium.

ILLUSTRATIONS AND PORTRAITS.

Many additions to the collection of photographs and drawings have been received and laid in during the year, including the following :—

Over 500 photographs, drawings and tracings of *Mesembryanthemaeae*, from the collection of the late Dr. N. E. Brown ; 50 plates of the " Flowering Plants of South Africa " from Dr. Pole Evans ; 44 water-colour drawings, 3 photographs and a pencil drawing prepared for the " Botanical Magazine " presented by the Royal Horticultural Society ; over 500 photographs of types, from the United States National Herbarium ; 115 photographs from Dr. A. L. Cabrera, Museo Nacional, La Plata, and 67 photographs from the National Herbarium, Pretoria. Mr. T. Green of Melbourne presented a fine collection of over 120 stereoscopic photographs of Victoria and New South Wales plants and bush scenery. A presentation of copies of Hooker's *Icones Plantarum*, together with a number of the original drawings, was made by the Bentham-Moxon Trustees. In addition, about 100 drawings, paintings and photographs were received from various sources, and have been incorporated in the collection.

A fine collection of portraits of eminent botanists, both English and foreign, which filled many gaps in our collection, was received from Prof. F. W. Oliver, and a further collection of portraits of British botanists was received from Mr. H. Stuart Thompson.

INDEX KEWENSIS.

Supplement 9 has been completed, the cards have been duplicated, and the originals have been sent to the Clarendon Press. The Supplement contains a greater number of entries than usual, there being nearly 40,000 cards. Already a large proportion of the proofs has been received, read, corrected and returned, and it is reasonable to hope that it will be published towards the middle of 1938. In order to comply more closely with the International

Rules of Botanical Nomenclature as amended at Cambridge and Amsterdam, some changes will be observed in the method of citation in the current Supplement ; for example, the comma between the specific epithet and the author's name has been omitted, and Article 49 has been followed rigidly as regards names of species, and as far as practicable in names of genera. Art. 49: "When a genus or a group of lower rank is altered in rank but retains its name or epithet, the original author must be cited in parenthesis, followed by the name of the author who effected the alteration. The same holds when a subdivision of a genus, a species, or a group of lower rank, is transferred to another genus or species with or without alteration of rank." It is felt that this citation of authors' names for purposes of precision will be a great help to all botanists engaged in systematic work.

Another slight alteration in form is the substitution of the word "hybr." by the signs \times or $+$ before the generic name or specific epithet.

As in Supplements 7 and 8 a list of new generic names placed under their families in alphabetical order will be appended.

The work of compiling Supplement 10 has already started, although progress will be slow until after the publication of Supplement 9.

NOMENCLATURE, BIBLIOGRAPHY AND HISTORY OF BOTANY.

The work on this subject increases yearly, due mainly to the fact that authors of botanical papers and floras realise more and more the desirability of adopting the correct names according to the International Rules. Very frequently lists are submitted for examination and it may take a considerable time to investigate the status of certain names. Assistance of this kind has been given whenever possible ; special mention may be made of the forthcoming "Flora of Devon" now in the hands of the printers.

Work in connexion with the International Committees on Nomenclature has been continued, especially concerning the correct names of Economic Plants.

An undertaking of exceptional interest has been the revision of the late Sir Arthur Hort's translation of Linnaeus's "Critica Botanica." This work consists of a series of aphorisms concerning rules of nomenclature with discussions on each, and it gives a clear insight into Linnaeus's views on this subject. As the translation had not been finally completed by the author, a considerable amount of work has been necessary to prepare it for the press. The book is being published by the Ray Society and will appear shortly.

A great deal of nomenclatural investigation has been carried out in connexion with a new edition of the "Handlist of Gymnospermae" and an effort has been made to obtain the correct names under the International Rules, since it is felt that the publication

will be a great asset to foresters and owners of collections. Up to the present the nomenclature of the group has been somewhat unstable.

Publications.—*Nomenclature*: *Pterocarpus Draco* L. (K.B. 1937, 63 and 477).

The correct name of the Yellow Hybrid Aster (K.B. 1937, 350).

On the status of the name *Bursera subsessiliformis* Engl. (K.B. 1937, 352).

On the identification of *Rhus filicina* Sessé & Moc. ex DC. (K.B. 1937, 440).

Epipogum or *Epipogium* (K.B. 1937, 475).

Notes on the Genus *Centaurium*: I (K.B. 1937, 497).

Bibliography.—Citations marked with an asterisk in Linnaeus's *Species Plantarum* (Journ. Bot. 1937, 78).

New names published anonymously by Robert Sweet in "The News of Literature and Fashion" (1824-26) (Journ. Bot. 1937, 192).

The dates of publication of Bentham's *Flora Australiensis* (Journ. Soc. Bibl. Nat. Hist. 1, pt. 3: 1937).

The dates of publication of Ecklon & Zeyher's "Enumeratio" and E. Meyer's "Commentarii" (Journ. Soc. Bibl. Nat. Hist. 1, pt. 4: 1937).

History of Botany: The Herbal of Valerius Cordus (Proc. Linn. Soc. Lond. 1937, pt. 3, 156).

Early Herbals (Pharm. Journ. 1937, 139, 515).

VISITORS.

The number of signatures in the Visitors' Book for the year 1937 was 5346.

The following kindly gave voluntary assistance in the Herbarium:—Mr. H. N. Ridley again helped in naming Malayan specimens, and Miss M. M. Whiting in arranging and classifying the Indo-Malayan material; Mr. R. A. Blakelock (before his appointment to the staff in July), and Miss D. A. Chaytor gave assistance in the European section, and Mr. D. P. Fanshawe in naming European and other collections. Mr. P. H. Simon kindly worked on grasses and helped in rearranging the North American species of *Paspalum*.

Amongst frequent or regular visitors were members of the staffs of the Department of Botany, British Museum (Natural History), the Imperial Mycological Institute, and the Imperial Forestry Institute, Oxford. The Staff employed by the Royal Horticultural Society in connexion with the preparation of the "Index Londinensis" and "The Botanical Magazine" have worked in the Herbarium and Library throughout the year.

The most noteworthy or frequent visitors to the Herbarium were the following:—

Prof. R. S. Adamson (Cape Town); Revd. Leslie W. A. Ahrendt; Mr. A. H. G. Alston; Mr. F. C. Armstrong (Perak); Major G. Aylmer (Sudan).

Mr. E. G. Baker ; Mr. E. K. Balls ; Miss W. F. Barker (Kirstenbosch) ; Miss E. C. Barnett ; Mr. J. Bausch (Rotterdam) ; Mr. W. J. Bean ; Dr. G. R. Bisby ; Dr. K. Biswas (Calcutta) ; Mr. J. P. M. Brennan ; Professor A. H. R. Buller (Winnipeg) ; Mr. I. H. Burkill ; Mr. B. D. Burt (Tanganyika).

Miss D. A. Chaytor ; Dr. A. Clark ; Dr. S. Clay ; Prof. R. H. Compton (Kirstenbosch) ; Mr. J. K. Cox (Gold Coast).

Dr. J. M. Dalziel ; Mr. J. E. Dandy ; Mr. A. G. Davis ; Mr. H. N. Dixon ; Mr. H. L. Dunkley.

Mr. A. W. Exell.

Mr. D. P. Fanshawe ; Dr. H. R. Fletcher ; Mr. F. Flippance (Penang) ; Miss Eva Francis ; Dr. Lilian Fraser (Sydney).

Mr. H. B. G. Garrett (late Forest Office, Siam) ; Dr. W. Balfour Gourlay ; Mr. A. Grove ; Dr. Otto von Gumpenberg (Berlin).

Mr. J. H. Holland ; Dr. D. Hooper ; Mr. A. C. Hoyle.

Miss J. B. Imlay.

Mr. A. Bruce Jackson.

Dr. A. F. G. Kerr ; Dr. A. Kostermans (Utrecht) ; Dr. & Mrs. Vladimir Krajina (Prague).

Mr. C. H. Lankester ; Mr. J. E. Lousley.

Mrs. Dorothea W. Mackay (Johannesburg) ; Mr. E. W. Mason ; Dr. H. E. McMinn (Oakland, California) ; Mr. S. K. Mukerji (Lucknow) ; Mr. B. O. Mulligan ; Mr. H. Muyser (Rotterdam).

Mr. C. Norman.

Lt.-Col. C. L. Meyler O'Malley.

Dr. Reuben T. Patton (Melbourne) ; Mr. T. Petch ; Dr. W. R. Philipson ; Dr. N. Polunin ; Mr. W. R. Price ; Mr. H. W. Pugsley.

Mr. H. N. Ridley ; Dr. Kurt Roos (Zurich).

Miss K. Sampson ; Mrs. C. I. Sandwith ; Mr. J. R. Sealy ; Mr. J. E. Senaratna (Peradeniya, Ceylon) ; Mr. P. H. Simon ; Mr. N. Douglas Simpson ; Miss L. Snelling ; Miss M. S. Sprague ; Mr. W. T. Stearn ; Major F. C. Stern ; Mr. A. L. Still ; Dr. H. K. Svenson (Brooklyn, Mass).

Mr. T. Tang (Peiping) ; Dr. G. Taylor ; Dr. W. R. Taylor (Ann Arbor, Mich.) ; Mr. A. W. Trethewy ; Mr. Robt. S. Trickett.

Miss J. W. Vickery (Sydney).

Mr. F. T. Wang (Peiping) ; Mr. E. F. Warburg ; Mr. C. A. Weatherby (Harvard) ; Mrs. M. L. Wedgwood ; Dr. Lewis E. Wehmeyer (Ann Arbor, Mich.) ; Miss M. M. Whiting ; Dr. Ira L. Wiggins (Stanford Univ., California) ; Mr. S. Baker Williams ; Miss Marian Wilson (Sydney) ; Mr. S. P. Wiltshire ; Dr. & Mrs. Tad. Wisniewski (Warsaw) ; Mr. W. C. Worsdell.

DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed :—

Great Britain.—London, British Museum (Natural History) ; Kew, Imperial Mycological Institute ; Oxford, Imperial Forestry Institute.

Europe and Orient.—Algiers, University Botanical Institute ; Berlin, Botanic Gardens and Museum ; Bologna, Botanical Institute of the University ; Brno, Masaryk University ; Brussels, Botanic Garden ; Cluj, Botanical Museum ; Florence, Botanical Institute of the University ; Geneva, Museum and Botanic Garden ; Helsingfors, Botanical Museum ; Krakow, Academy of Sciences ; Leiden, 's Rijks Herbarium ; Leningrad, Botanical Museum of the Academy of Sciences ; Lund, Botanical Museum ; Lisbon, Colonial Garden ; Paris, Natural History Museum ; Stockholm, Natural History Museum ; Utrecht, Botanical Museum and Herbarium ; Zurich, University Botanical Museums and Gardens.

Asia.—Calcutta, Botanic Gardens ; Buitenzorg, Botanic Gardens.

Africa.—Amani, East African Agricultural Research Station ; Pretoria, National Herbarium.

America.—Brooklyn, Botanic Garden ; Buenos Aires, Botanical Laboratory of the Faculty of Agriculture ; Cambridge, Gray Herbarium and Farlow Herbarium ; Gainesville, University of Florida ; Ithaca, Bailey Hortorium ; Jamaica Plain, Arnold Arboretum ; Jamaica Plain, Oakes Ames Herbarium ; New York, Botanical Garden ; La Plata, Museo de La Plata ; Washington D.C., United States National Museum.

Australia.—Brisbane, Botanic Museum and Herbarium ; Melbourne, National Herbarium.

Oceania.—Honolulu, Bernice P. Bishop Museum.

The Library

The task of preparing for publication Supplement 2 of the Library Catalogue was begun in 1937. This has occupied the time of the Acting Librarian for a considerable portion of the year. It is hoped that the work will be finished during the early part of 1938.

The Assistant Librarian has continued to devote a part of most days to the cataloguing of the arrears mentioned in last year's report as having been taken in hand. Only a comparatively unimportant residue of this now remains uncatalogued, and it is probable that this will be cleared up in 1938. It should perhaps be mentioned that current cataloguing, which is of considerable extent, is dealt with week by week in addition to the arrears.

Arrears of binding have also been considerably reduced, owing to the renewal of a special grant for this purpose. As many as 569 books under this heading have been sent to the binders during 1937. One important class of "arrears" of binding is the large number of old botanical works and papers which were broken up from composite volumes many years ago and placed in the tracts. Many of these are of great importance to taxonomists, and should be bound up for their better protection, and made more readily available by being placed in the subject arrangement on the shelves.

The quarto tracts have been dealt with in this way during 1937, and the octavos will be taken in hand early in 1938.

The third member of the library staff, besides performing the routine work of entering books, etc., has prepared and despatched 556 current volumes to the binders. A start has also been made on the arrangement and preparation for binding of plant lists which have not been bound for some years and were becoming difficult to consult.

Two bibliographical papers dealing with the dates of publication of works containing new botanical names were published during 1937. These are included under the heading "Nomenclature and Bibliography," p. 569.

PRESENTATIONS TO THE LIBRARY.

Mrs. M. L. Wedgwood has given to the Library 44 volumes from the library of the late C. E. Salmon. They are largely local British and Continental Floras, and have considerably enriched the Kew representation of these sections of botanical literature. Many of them have been rebound with the kind help of the donor.

Sir David Prain has presented to the Library the continuation of a number of periodicals, as in many former years.

A further volume of the *Flora URSS*, i.e. vol. 6, has been given to Kew by the Botanical Institute of the Academy of Sciences, Leningrad.

Kew is indebted to the New York Botanical Garden for *Addisonia*, *Brittonia*, and the *North American Flora*, in continuation, and for other publications.

The Trustees of the British Museum have presented the following:—*An index to the authors (other than Linnaeus) mentioned in the Catalogue of the Works of Linnaeus preserved in the Libraries of the British Museum.* Ed. 2, 1933.

The Crown Agents for the Colonies have presented, among other publications, four copies of Dr. J. M. Dalziel's *Useful Plants of West Tropical Africa*.

From the Geological Society have come a number of volumes of the Contributions of the United States National Herbarium and of Hayata's *Icones Plantarum Formosanarum*.

Two copies of the *Lily Year-Book* for 1937 (No. 6) have been presented by the Royal Horticultural Society.

The Bentham-Moxon Trustees have presented the following works to the Library during 1937: P. J. D'Avoine and Charles Morren, *Éloge de Rembert Dodoëns . . . suivi de la concordance des espèces végétales décrites et figurées par Rembert Dodoëns*, etc., Malines & Bruxelles, 1850, a valuable addition to the Library in connexion with our set of Dodoëns' works; E. Bonnet, *Les Thériacques de Nicandre d'après les figures du manuscrit grec de la Bibliothèque Nationale de Paris* (Bull. Soc. Synd. Pharm. Côte-d'Or, no. 28), 1911, and the same author's *Documents pour servir à*

l'histoire de la collection de Miniatures d'Histoire Naturelle connue sous la denomination de Vélins du Museum (Comptes Rendus Assoc. Franç. Avanc. Sci., Congr. Montauban) Paris, 1903; A. White & B. L. Sloane, *The Stapelieae*, Pasadena, 1937, the second edition of this work in 3 volumes; W. Rytz, *Pflanzenaquarelle des Hans Weiditz aus dem Jahre 1529. Die originale zu den Holzschnitten im Brunfels'schen Kräuterbuch*, Bern, 1936, containing 15 reproductions of Weiditz's coloured drawings.

The Trustees have also enabled Kew to secure the continuation of various journals by placing at its disposal exchange copies of Hooker's *Icones Plantarum*.

The Editor of "Nature" has presented the following:—Q. C. Ayres, *Soil erosion and its control*; J. Braun-Blanquet and E. Rübel, *Flora von Graubünden*; M. Buchli, *Oekologie der Ackerunkräuter der Nordostschweiz*; J. S. Gamble and C. E. C. Fischer, *Flora of the Presidency of Madras*, part XI; H. S. D. Garven, *Wild flowers of N. China and S. Manchuria*; C. L. Gatin, *Les fleurs des bois*; H. Gilbert-Carter, *British trees and shrubs*; A. F. Hill, *Economic botany: A textbook of useful plants and plant products*; H. G. Jameson, *Trees and flowers of England and Wales*; L. Jost, *Baum und Wald*; D. Kenmare, *The country's year and other nature writings*; L. C. C. Krieger, *The mushroom handbook*; J. Motte, (1) *Castanea crenata*, Sieb. et Zucc. *Esquisse d'un répertoire des variétés japonaises*, (2) *Le Kikyō (Platycodon grandiflorum D.C.)*; J. A. Neame, *Among the meadow and alpine flowers of N. Italy*; J. C. Newsham, *The horticultural notebook*; M. A. Reynaud-Beauverie, *Le milieu et la vie en commun des plantes*; G. P. Slater, *A walk through garden, wood and field*.

The following publishers have sent the books mentioned for review in the Bulletin:—G. Allen and Unwin: T. Niwa, *Chrysanthemums of Japan*; W. J. C. Lawrence, *Practical plant breeding*; Messrs. Edward Arnold: H. Drabble, *Plant ecology*; John Bale, Sons and Curnow: J. H. Holland, *Overseas plant products*; A. W. Knapp, *Cacao fermentation*; Chapman and Hall: G. C. Ainsworth, *The plant diseases of Great Britain*; A. L. Winton and K. B. Winton, *The structure and composition of foods*, vol. 1: *cereals*, etc.; W. Heffer & Sons; E. R. Saunders, *Floral morphology*, I; T. C. & E. C. Jack: S. Clay, *The present-day rock garden*; Macmillan & Co.; J. Borg, *Cacti*; J. H. McFarland & R. Pyle, *How to grow roses*, ed. 18; L. Mansfield, *An artist's herbal*.

The following important works were presented by their authors unless otherwise stated:—L. E. Anderson, *Mitochondria in the life cycles of certain higher plants* (Diss., University of Pennsylvania); E. B. Babcock and G. L. Stebbins, *The genus Youngia* (from Prof. E. B. Babcock); G. Benthall and others, a MS list of Schomburgk's Guiana plants (from Dept. of Botany, University College of N. Wales, Bangor); C. V. Boys, *Weeds, weeds, weeds* (from Wightman & Co. Ltd.); R. Bracher, *Ecology in town and classroom*; H. Bravo,

Las Cactaceas de Mexico (from the Director, Instituto de Biología, Mexico); British Association for the Advancement of Science, *Report of the Annual Meeting 1936* (from Miss E. M. Wakefield); H. Chermezon, *Révision des Cyperacées de Madagascar* (3^{me} Partie); Ren-Chang Ching, *Icones filicum Sinicarum*, Fasc. 4; E. Chiovenda, *La collezione botanica fatta dall'Ing. Edgard Taschdjian nell' Impero Etiopico nel 1935-36*; N. Chowdhury, *Notes on some Indian species of Lycopodium with remarks on the distribution of the genus in India*; M. Chrysostom, *The influence of several benzene derivatives on the roots of Lupinus albus* (Diss., University of Pennsylvania); H. N. Coley, (1) *Our heritage of fruits*, (2) *Our heritage of garden flowers*; Collecting books of the late Thomas Cooper, 3 vols. (from Miss E. E. Brown); J. Burt Davy and A. C. Hoyle (Eds.), *Check-lists of the forest trees and shrubs of the British Empire*, No. 3 (from the Director, Imperial Forestry Institute, Oxford University); A. E. Douglass, *Climatic cycles and tree growth*, Vol. 3 (from the Carnegie Institution of Washington); J. K. Edwards, *Cytological studies of toxicity in meristem cells of roots of Zea Mays*, I (Diss., University of Pennsylvania); *Fungi exsiccati Suecici, praesertim Upsalienses*, Fasc. I-II (from Miss E. M. Wakefield), Fasc. III-VIII (from J. A. Nannfeldt); J. R. Furlong (Ed.), *The preparation of Empire hides and skins* (from Director, Imperial Institute); E. H. Graham, *Flora of the Kartabo Region, British Guiana*; P. J. Greenway, *A Swahili dictionary of plant names* (from Director, East African Agric. Res. Stat., Amani); C. H. Grey, *Hardy bulbs*; J. H. Holland, *Overseas plant products* (3 copies); P. Horaninow, *Prodromus monographiae Scitaminearum* (from Dept. of Botany, University College of North Wales, Bangor); G. Houtzagers, *Het geslacht Populus in verband met zijn beteeknis voor de houtteelt*; E. Hultén, *Outline of the history of arctic and boreal biota during the Quaternary Period*; H. A. Hyde, *Trees and shrubs*; M. M. Iljin, *The family Chenopodiaceae*; U. N. Kanjilal, P. C. Kanjilal, A. Das and C. Purkayastha, *Flora of Assam*, Vol. 1 (Part II) (from the Conservator of Forests, Assam); S. R. Kashyap, *Lahore District flora* (revised and completed by A. C. Joshi, with a foreword by H. Chaudhuri) (from Dr. H. Chaudhuri); B. A. Keller (Gen. Ed.), V. N. Lubimenko, M. M. Iljin, R. J. Kristson, V. N. Makogon (Editors), *Rubber and rubber-plants* I, 1936 (from Dr. M. M. Iljin); J. H. Kempton and W. Popenoe, *Contributions to American archaeology*, No. 23 (from Carnegie Institution of Washington); R. Kidston and W. H. Lang, *On Palaeopitys Milleri McNab* (from Dr. W. H. Lang); R. Kidston and W. H. Lang, *Notes on fossil plants from the Old Red Sandstone of Scotland*, I (from Dr. W. H. Lang); A. J. G. H. Kostermans, *Revision of the Lauraceae II*; I. M. Lamb, *On the morphology and cytology of Puccinia Prostii, Mong., a micro-form with Pycnidia*; C. S. Larsen, *The employment of species, types and individuals in forestry*; J. Lebrun, *Répartition de la forêt équatoriale et des formations végétales limitrophes*; T. Lippmaa, *Les collections systématiques*

et phytogéographiques du Jardin Botanique de l'Université Estonienne à Tartu; C. L. Lundell, *The vegetation of Petén* (from Carnegie Institution of Washington); T. A. McElhanney and associates, *Canadian woods: their properties and uses* (from Forest Service, Department of the Interior, Canada); F. A. Mason (completed by J. Grainger), *Catalogue of Yorkshire fungi* (from W. G. Bramley); *The natural history of the Isle of Raasay and of the adjacent islands of South Rona, Scalpay, Fladday and Longay* (from J. W. Heslop-Harrison, Armstrong College, Newcastle-on-Tyne); S. O. F. Omang, *Die Hieracien Norwegens*, I; H. Pittier, *Lista provisional de las Gramineas senaladas en Venezuela hasta 1936, con notas acerca de su valor nutritivo, etc.*; G. Redington, *A study of the effect of diurnal periodicity upon plant growth*; W. Robyns, *Contribution à l'étude des formations herbeuses du district forestier central du Congo Belge*; L. Rodway, *Tasmanian Bryophyta, Vol. II, Hepatics* (from F. A. Rodway); C. O. Rosendahl, F. K. Butters and O. Lakela, *A monograph on the genus Heuchera* (from University of Minnesota); H. St. John, *Flora of south-eastern Washington and of adjacent Idaho*; *St. Kilda papers*, 1931 (from Oxford University Press); H. Schinz and K. Ulrich, *Notizen zur schweizerischen Kulturgeschichte*, including B. Milt, *Conrad Gessner's Historia Plantarum (Fragmenta relict)*; H. Schwenkel, (1) *Veröffentlichungen der staatlichen Stelle für Naturschutz beim Württ. Landesamt für Denkmalpflege*, Hefte 3-10, (2) *Vom Naturschutz in Württemberg* (from Dr. H. G. Schweickerdt); W. A. Setchell, *Essays in geobotany*; M. L. Shcherbina, *Apricots of the Acclimatization Garden of the Academy of Sciences of the U.S.S.R.* (from Director of the Academy Library, Academy of Sciences of the Ukrainian S.S.R.); E. E. Sherff, *The genus Bidens*, Parts I & II; J. C. B. Statham, *With my wife across Africa* (from Mr. A. A. Bullock); J. Stirling-Maxwell, *Loch Ossian plantations* (from Mr. A. K. Jackson); J. McLean Thompson, *Studies in floral morphology*, III; G. S. Thomson, *Life in a noble household*; E. Vachell, *Glamorgan flowering plants and ferns*; F. Kingdon Ward, *Map of the Botanical and geographical explorations in Tibet*, 1935 (from Mr. C. E. C. Fischer); D. P. Watson, *Structure of the testa and its relation to germination in the Papilionaceae tribes Trifoliae and Loteae*; A. White, B. L. Sloane and others, *The Stapelieae* (from Mr. A. White); L. O. Williams, *A monograph of the genus Mertensia in North America* (from Missouri Botanical Garden); W. Withering, *An arrangement of British plants*, Vol. IV. (from the Right Rev. J. R. Harmer); R. C. Wood, *A notebook of tropical agriculture* (from the Editor, Tropical Agriculture); E. V. Wulff (Ed.), *Flora of cultivated plants of U.S.S.R., Vols. I and II*.

Periodical publications, additional to those mentioned in recent Reviews, which have been presented by the editors, societies or institutions issuing them, unless otherwise stated, are as follow:—*Acta Universitatis Voronegiensis* (botanical volumes only, tom.

7 & 9) ; *Bulletin of the Colonial Institute of Amsterdam*, vol. i, no. 1 ; *Contributions from the Laboratory of Systematic Botany and Plant Oecology, Taihoku Imperial University*, no. 1 ; *Icones Plantarum Formosanarum*, VI : *Supplement* (from the Department of Forestry, Formosa) ; *Imperial Forestry Institute Papers*, nos. 1-11 (*Oxford University*) ; *Journal of the Scottish Rock Garden Club*, No. 1, 1937 ; *Journal of the Southern Appalachian Botanical Club*, vol. 1 & vol. 2, nos. 1-6 ; *Lavori Istituto Botanico R. Università di Modena*, nos. 1-7 ; *Naturalia* . . . publ. Sociedade Portuguesa de Ciências Naturais, vol. 1, nos. 1-4 ; *Orchid Digest*, of the Orchid Society of California, vol. 1, nos. 1-3 ; *Studia Botanica Cechoslovaka*, vol. 1, no. 1 ; *Transactions of the Omsk Institute of Agriculture*, vol. 1, no. 1 ; *Travaux de l'Institut Scientifique de Biologie, Tomsk*, vol. 1.

Various publications have continued to come from the Empire Cotton Growing Corporation, the Imperial Agricultural Bureaux and from many Departments of Botany, Agriculture and Forestry at home, in the overseas Empire, and in foreign countries.

Once again we are indebted to authors, too numerous to mention in detail, for reprints of their botanical papers.

Further maps of the fifth (relief) edition have been kindly presented by the Ordnance Survey Office, Southampton, while the War Office has continued to supplement our map collection by sending us copies of their maps as issued.

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